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Evolutionary Fundraising Patterns and Entrepreneurial Performance in Crowdfunding Platforms

Research-in-Progress

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Abstract

The emergence of crowdfunding could unleash substantial changes in the business environment. With the new funding platform, technology start-ups can easily access external resources. For fledgling entrepreneurs, both obtaining financial resources and creating innovation are important for their survival. Most research has been focusing on how entrepreneurs successfully raise money, but there is lack of attention to whether successfully funded crowdfunding projects deliver outcomes or not. We investigate the existing dynamics in fundraising process, and how the fundraising patterns are related to crowdfunding projects performance. We develop our research hypotheses based on entrepreneurship theory and bandwagon effects literature. Using functional data analysis method, we examine our research questions. The current findings show the various impacts of fundraising patterns on entrepreneurs’ performance. This study will contribute to crowdfunding and entrepreneurship literature and offer practical implications by providing a theoretical framework and the supporting empirical evidence.

Keywords: Fundraising Patterns, Entrepreneurial Efforts, Crowdfunding Success, Entrepreneurial Performance, Entrepreneurship
Introduction

Crowdfunding, the digital funding platform, has become a viable funding option, which provides technology start-ups with new opportunities of funding. Under traditional funding mechanisms, start-up companies have experienced considerable difficulties in obtaining external funding (Gompers and Lerner, 2001), because of the lack of sufficient signals about the legitimacy of their business and external visibility (Aldrich and Fiol, 1994; Zott and Huy, 2007). Crowdfunding allows entrepreneurs to take actions in attracting funding from large groups of potential funders and to reach crowds of unprecedented scale at a lower cost. With the new funding platform, technology start-ups readily obtain seed money for their business, overcome nascence, and build legitimacy for additional external investments. Recently, we observe many successful stories of crowd-funded technology start-ups such as Pebble Watch, FORM 1, and Oculus Rift. Isaac (2013) highlights how Kickstarter has changed the trends at Consumer Electronic Show (CES) in 2013, which is where indie hardware developers have been gaining attention previously paid to large companies. Because of this importance of crowdfunding, recently many researchers have paid attention to how entrepreneurs can successfully raise money in the platform.

Despite the popularity of crowdfunding, according to CNN Money (Dec. 18, 2012), 84% of Kickstarter’s top successfully funded projects failed to deliver or were delayed in delivering the promised products. Mollick (2013) argues that only 24% of successfully funded projects in Kickstarter delivered outcomes to funders on time. Thus, some project creators on these platforms may be the ones that have the ability to raise financial resources but are less likely to be successful at generating successful innovations and vice versa. The failure rate of crowdfunding projects is slightly lower than the one’s in traditional funding context, but the gap is not too big. However, the fundraising mechanisms, type of projects, entrepreneurs’ and funders’ characteristics in crowdfunding are quite different from the traditional funding methods. For example, some successfully funded projects in Kickstarter (e.g., Pebble watch) were turned down by venture capitalist at first.

Compared with traditional funding methods, crowdfunding raises money from the “crowd” through a process of “collective evaluation” mechanisms (Burch, Ghose, and Wattal, 2013). Because of such mechanisms, funders sometimes could contribute small amounts of money to projects without any professional expertise or the ability to evaluate the quality of projects as well as entrepreneurs’ potentials. Thus, some funders could likely be drawn to a particular project based on its external visibility and bandwagon effects rather than the intrinsic performance. In addition, many crowdfunding platforms do not have strict enforcement mechanisms in place and the absence of external validation measures of the project creators’ potentials and the lack of quantifiable information about project quality causes the overall crowdfunding platform to suffer from the information asymmetry issues. There are hidden information problems and some investors may not have the ability to evaluate projects’ quality and an entrepreneur’s potential performance.

For fledgling entrepreneurs, both obtaining external financial resources and creating new innovation are important for their survival. Therefore, it is necessary to research the entrepreneurs’ project performance in crowdfunding platforms. The inappropriate outcome will negatively affect the entrepreneur’s reputation and future funding opportunities. Furthermore, it may influence the overall ecology of digital funding and entrepreneurship. However, crowdfunding research to date has mainly focused on antecedents and mechanisms of fundraising success. There is a lack of investigation of the mechanisms underlying why some successfully funded projects could not deliver promised outcomes on time in crowdfunding platforms. While a few studies explore how wording errors, number of backers, and

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1 According to the National Venture Capital Association, through traditional funding methods technology ventures have 25-30% failure rates to back returns to the investors, http://online.wsj.com/news/articles/SB10000872396390443720204578004980476429190

2 Compared to traditional funding methods, in crowdfunding platform funders usually contribute small amounts of money to projects (from $1 or $5).

3 In our research context, inappropriate outcome means that projects fail to deliver promised outcome on time.
percentage of funded amounts influence project delays to delivery, they have not explained how fundraising dynamics influence project performance.

To elaborate upon why some successfully funded projects could not deliver promised outcomes on time; we investigate how the dynamic fundraising patterns influence project performance using entrepreneurship theory and bandwagon effects as a theoretical lens. Entrepreneurs’ negative or positive performance could be driven by the nature of a project itself as well as the nature of entrepreneurs’ innovation capability. However, these factors may not be sufficient to explain how entrepreneurs actually perform their innovation. Entrepreneurs’ behaviors and efforts to obtain necessary resources and to achieve innovation are contingent upon the fundraising environment (Lounsbury and Glynn, 2001; Baker, Miner, and Eesley, 2003). Thus, fundraising patterns can influence the dynamics of the entrepreneurs’ actions to deliver promised outcomes. Because of limited resources, entrepreneurs should effectively allocate such resources as time and effort. An entrepreneur, who achieves the funding momentum earlier in the fundraising process, can put more effort into actual production than a funding seeker who needs to focus on more efforts to raise money. Entrepreneurs who have prior visibility or experience will have more chance to get legitimacy on fundraising in the early stage than others. Additionally, fundraising dynamics also represent how bandwagon effects influence entrepreneurs’ performance. Projects which get hype-funding in the late stage without having one in the early stage, make entrepreneurs engage more in raising funds than actual performance during fundraising period. Furthermore, such unexpected demands may burden entrepreneurs. Thus, hype-funding in the late stage may represent the negative aspect of bandwagon effects which cause negative performance.

The main research questions we will address are as follows:

(1) Are there different dynamic fundraising patterns among crowdfunding projects?

(2) Do the evolutionary fundraising patterns help predict entrepreneurs’ performance? If so, how do the evolutionary patterns influence entrepreneurs’ performance?

Employing functional data analysis method, this study examines the impact of fundraising trajectory on entrepreneurs’ performance. Daily funding evolution data enables us to explain the different trajectories. We treat each funding trajectory as the unit of analysis and find that the shape of the curve adds power in predicting crowdfunding projects’ performance. We collected the data of technology crowdfunding projects from a reward-based crowdfunding platform in the U.S. We observed actual performance of projects that were initiated and successfully funded from March 2012 to Feb. 2013. There are a total of 124 successfully funded projects that provide delivery information and daily transaction data. Our empirical results show the existence of different fundraising patterns and different impacts on entrepreneurial performance. Projects that create early momentum are associated with positive projects’ performance. However, projects which do not attract early funding but have late hype-funding negatively influence projects performance. This study will contribute to entrepreneurship and crowdfunding literature by providing a conceptual model to explain how fundraising patterns influence project performance in crowdfunding markets and the supporting empirical evidence.

In the next section, we review extant theories and propose hypotheses. In the following section, we explain our data and empirical model, and then we present the current results. Lastly, we discuss theoretical and managerial implications of this study and provide future research direction.

Theoretical Background

The first step of entrepreneurial success is obtaining necessary resources for the growth of business from external sources. However, start-ups who lack a history of proven success, formal credentials, and external endowment have experienced difficulty in raising external funding (Aldrich and Fiol, 1994). Because of the liability of novelty, entrepreneurs who have confronted those issues have struggled to obtain legitimacy in the early stage of business (Low and Abrahamson, 1997). Crowdfunding provides technology start-ups with a new avenue for funding and building legitimacy of business. This digital funding platform enables entrepreneurs to access and mobilize pools of resources to start new business and to move into new lines of business. Based on prior research, we define crowdfunding as “a novel method for generating funds by tapping into the collective and allowing project creators (e.g.,
entrepreneurs) from various areas to request funding from many individuals via the Internet” (Schwienbacher and Larralde, 2010; Mollick, 2012). Any individual or entrepreneur can create as well as fund projects in crowdfunding platforms. In general, there are four types of crowdfunding platforms: donation, reward, lending, and equity-based (Burtch et al., 2013). Although crowdfunding is not a completely new concept, it differs from traditional funding methods such as micro-financing and angel capital investment in terms of economies of scale and scope of accessible resources (Mollick, 2012). Rewards differ across crowdfunding platforms and monetary rewards are not always necessary. But even more importantly, it raises money from the “crowd” through a process of “collective evaluation” mechanisms (Burtch et al., 2013). Funders can contribute small amounts of money to projects without any professional expertise or the ability to evaluate the quality of projects as well as entrepreneurs’ potentials. In the platform people can easily observe others contributions, accumulated contributions and entrepreneurs’ information. Additionally, in order to garner financial resources, entrepreneurs perform actions to cue plausibility and credibility of their business.

**Figure 1. Overview of Fundraising Dynamics in Crowdfunding Platforms**

In crowdfunding platforms, entrepreneurs can easily interact with funders and convey information about projects. In turn, the fundraising process results from the combination of dynamics among funders, entrepreneurs, and projects in crowdfunding platforms, which may vary across the projects (see Figure 1). Thus, we expect that there are different fundraising patterns in crowdfunding platforms. In order to study the relationship between the dynamic fundraising patterns in crowdfunding projects and the subsequent performance of entrepreneurs, the fundraising patterns are categorized into four types (1) early momentum and hype-growth pattern, (2) early momentum and stable growth pattern, (3) late hype-growth without early momentum pattern, and (4) fluctuation without early momentum pattern. Early momentum models obtain abnormal funding (over the average funding amounts across projects) in the early stage, and late hype-funding models are observed when abnormal funding (over the average funding amounts across projects) exist in the late stage. The four fundraising patterns conceptually related to the phenomenon of resource scarcity. Early momentum funding patterns implies a low level of financial resource scarcity for the entrepreneur in the early stage. Since entrepreneurs ultimately seek to generate new business value, they engage in efforts to identify resources and opportunities (Shane & Venkataraman, 2000). Most start-ups have strong external resource dependency. According to prior research, the entrepreneur’ behaviors are formed by a context-dependent social process (Lounsbury and Glynn, 2001; Low and Abrahamson, 1997). Entrepreneurs’ strategic actions to obtain legitimacy and access necessary resources are contingent upon the environmental context (Lounsbury and Glynn, 2001; Baker, Miner, and Eesley, 2003). Therefore, different dynamics in fundraising patterns may influence entrepreneurial performance, which can explain more about the impact of unobserved entrepreneurial
actions and dynamics that cannot be explained by other factors. Because of limited resources, entrepreneurs should effectively allocate such resources as time and effort. Entrepreneurs, who achieve early momentum of funding in the overall fundraising process, can put more effort into actual production than those who need to focus on more effort to raise money. These contingent entrepreneurs’ actions will influence their performance differently. The former may positively influence performance but latter one may not have a positive impact on performance. In addition, early momentum of funding often create slack resources, which are defined as resources in excess of what is required, allowing an entrepreneur to adapt successfully to internal and external pressure and changes (Sharfman et al, 1988). The slack resources can positively influence entrepreneurial performance (Sharfman et al, 1988). Thus, we propose the following hypothesis.

**H1:** The early momentum pattern positively influences entrepreneurs’ performance.

Bandwagon effects refer to a tendency for people to follow the previous behaviors of critical mass, which corresponds to the crowd under conditions of uncertainty, and adopting or deferring to the same behaviors that others have already accepted (Abrahamson and Rosenkopf, 1990; Fiol and O’Connor, 2003; Rosenkopf and Abrahamson, 1999). Bandwagon effects do not always involve rationality of decision (Abrahamson and Rosenkopf, 1990; Fiol and O’Connor, 2003). Bandwagon effects are motivated by several sources such as legitimacy, social relation, peer pressure, external visibility, and so on (Fiol and O’Connor, 2003, Sunstein, 2005). In a crowdfunding context, bandwagon effects mean that people make funding decisions by following others’ funding behaviors after certain thresholds are reached, regardless of their own evaluation about the project quality. A funder, who knows little about a project, is more likely to contribute to a project if many others already have contributed. Thus, funders exhibit a propensity to gravitate toward projects that already have established some popularity or reached their goals because funders correlate the quantity of prior contributions with the quality of projects, or legitimacy of entrepreneurs. In an early stage, people’s funding decisions mainly depend on external visibility, signals from entrepreneurs’ attributes and project characteristics, rather than bandwagon effects. After reaching certain tipping points, start-ups are able to obtain certain level of legitimacy based on the accumulated funding amounts, and more people may fund the projects because of the perceived legitimacy. Thus, a project that has a certain level of accumulated prior contribution amounts will be likely to attract more funding. In crowdfunding platform, there are several information asymmetry issues. Bandwagon effects are not always based on the rational decision making, sometime the over conformity can make negative impacts on society (Sunstein, 2005). Projects might experience fundraising success because of others’ behaviors, fads, or popularity of projects. In certain cases, bandwagon effects have negatively influenced project performance. When the late hype-growth pattern without early momentum is observed, the bandwagon effects may negatively influence potential performance because either the projects may not have good quality or entrepreneurs are not well prepared for executing projects. Excess resources from hype-funding can create risk to execute more outcomes. Entrepreneurs are less likely to manage the increased expectations, which exacerbate entrepreneurial performance. Thus, we propose this following hypothesis.

**H2:** The hype-funding pattern in the late stage negatively influences entrepreneurs’ performance.

**Data and Methodology**

**Data**

We collected funding projects’ data from Kickster.com, one of the reward-based crowdfunding platforms in the U.S., and entrepreneurs’ characteristics data from LinkedIn which is the most popular professional social network site. Our sample focuses on the projects initiated and successfully funded within the Technology category from March 2012 to February 2013. The prior study shows that the project
performance (delivery rate) does not differ across categories within a crowdfunding platform (Mollick, 2013). After eliminating projects which do not provide with any delivery information and longitudinal data, small size funding (less than $100), and short duration projects (less than 7 days), there are a total of 124 successfully funded projects. We define project performance using whether entrepreneurs deliver their promised outcomes to funders by the estimated delivery date, and coded the project performance using binary variable (0 or 1)\(^4\). The observation window was closed on August 2013.

**Methodology**

To identify fundraising patterns and to model the evolutionary fundraising process, we employ the Functional Data Analysis (FDA) method. We examine each function as the unit of observation (Ramsay and Silverman, 2005; Sood, James, and Tellis, 2009). FDA can effectively incorporate the entire fundraising histories (Ramsay and Dalzell, 1991). To explain the relation between fundraising dynamics (longitudinal, observed daily funding dynamics for each project until the project’s ending date) and entrepreneur’s performance (delivery information; cross-sectional), we face the challenge of the curse of dimensionality and regressing multi-dimensional vector on a scalar variable. The FDA approach helps overcome this challenge because it allows us to capture most of the variability in fundraising across fundraising days with a few functional principal components and significantly reduce the dimensionality (Ramsay and Silverman, 2005). To identify evolutionary fundraising patterns, we create functional data and assess the trend of data. We have data of each project’s daily funding dynamics consisting of daily observations. We use penalized smoothing splines to recover the underlying continuous smooth fundraising dynamic curve \(V_j(t)\) for each project \(j\) (\(j = 124\)) by removing random influences (Ramsay and Silverman 2005, Sood et al., 2009). The spline basis is defined by the sequence of knots on the daily interval. The roughness of a curve is measured as the integrated squared second derivative. A smoothing parameter \(\lambda\) is equal to \(10^{-2}\). As \(\lambda\) approaches 0, the fit of the function to the observation improves. Next, we perform functional principal component analysis (FPCA) to identify the most critical features of fundraising patterns by displaying the modes of functional variation. Techniques of smoothing are incorporated into the FPCA. The optimal number of patterns is determined by identification mechanism. Based on the results of FPCA, we examine the impact of the identified evolutionary fundraising patterns on entrepreneurs’ performance along with other factors.

**Preliminary Results**

Figure 2 represents functional principal component analysis (FPCA) results using cumulative daily funding amounts. We observe four distinct fundraising patterns (1) early momentum and hype-growth pattern, (2) early momentum and stable growth pattern, (3) late hype-growth without early momentum pattern, and (4) fluctuation without early momentum pattern across crowdfunding projects. The first fundraising model continuously attracts funding from the early stage and creates hype-funding at the end of fundraising duration. The second model is early momentum and stable growth pattern, which creates hype-funding in the early stage but not in the late stage. The third model represents late bandwagon model (late hype-growth without early momentum pattern). These projects could not attract large funding in the early stage but attract late hype-funding. The last model is similar to the third one but it has less stable pattern.

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\(^4\) In Kickstarter.com, projects can have multiple rewards which project creators should deliver. In our research context, we consider projects are success when project creators successfully deliver every rewards by the estimated delivery dates (code 1, otherwise code 0).
Using the FPC results, we analyze the project performance model in a crowdfunding platform. Project performance will be influenced by multiple factors. While our study focus on the impact of evolutionary fundraising patterns on projects performance, we also control project characteristics such as size of goal, average funding amounts, category effect, seasonal effect, number of funders, the volume of online interactions, and entrepreneurs’ experience and education. Project performance refers whether entrepreneurs delivered promised outcomes on time or not. Project performance is measured by a binary variable (delay: 1, otherwise: 0). Following is our performance model. We examine the impact of evolutionary fundraising patterns ($\beta_p c_{jp}$) on projects performance along with controlling other variables ($\gamma$).

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\text{Performance Model: } y_j = \beta_0 + \sum_{p=1}^{P} (\beta_p c_{jp}) + \text{control}_j \gamma + \epsilon_j ,
\]

Where $\beta_p$ is the coefficient of the $p$th FPC score $c_{jp}$, and $\gamma$ is the vector of the coefficients of control variables. Table 1 presents the preliminary analysis results. We compare three different models. Model 1 does not include any funding characteristics. The results show the negative relations between entrepreneurs’ experience and project delay (pseudo $R^2 = 0.140$). The second model includes percentage of funding amounts. This model also shows the negative impact of entrepreneurs’ prior experience on project’ delays (pseudo $R^2 = 0.142$). However, we cannot observe the significant impact of percentage of pledged amounts on performance. The third one is our performance model which includes the impact of evolutionary fundraising patterns on projects performance. It shows higher Pseudo $R^2 = 0.211$ than other two models. Also, we observed the negative influence of the second pattern (early momentum model and stable growth) on project delays and positive influence of the third pattern (late hype-funding model without early momentum) on project’ delays. The empirical results support the hypothesis 1 and 2. We cannot observe the significant impact of the early momentum and hype-growth model. Additionally, we observe the strong negative influence of entrepreneur’s prior experience on project delays in the Model 3.
Table 1. Effect of funding pattern on projects performance (Logistic Regression, DV: Delays)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model1</th>
<th>Model2</th>
<th>Model3</th>
</tr>
</thead>
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<tr>
<td>Funding Trend</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type1</td>
<td></td>
<td>-0.0002</td>
<td></td>
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<tr>
<td>Type2</td>
<td></td>
<td>-0.003**</td>
<td></td>
</tr>
<tr>
<td>Type3</td>
<td></td>
<td>0.010***</td>
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</tr>
<tr>
<td>Type4</td>
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<td>% Pledged amounts</td>
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<td>-0.201</td>
<td>-0.13</td>
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<tr>
<td>Experience</td>
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<td>-1.201**</td>
<td>-1.34**</td>
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<td>0.080**</td>
<td>0.09***</td>
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<td>0.007**</td>
<td>-0.001**</td>
</tr>
<tr>
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<td>0.003</td>
<td>0.005*</td>
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<tr>
<td>Average amounts</td>
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<tr>
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<td>-0.124</td>
<td>-0.167***</td>
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<td>-67.48</td>
<td>-62.08</td>
</tr>
<tr>
<td>Pseudo R²</td>
<td>0.140</td>
<td>0.142</td>
<td><strong>0.211</strong></td>
</tr>
</tbody>
</table>

Discussion, conclusion and future direction

Crowdfunding play an important role in our society and economy, making major contributions to new firm creation, job creation, employment, and economic growth. We investigated the dynamics of fundraising in crowdfunding projects, identified different fundraising patterns, and examined how the dynamic patterns influence crowdfunding projects performance. Using the entrepreneurship theory and a new empirical method, we attempted to explain observed dynamics and underlying mechanisms of fundraising patterns derived by projects, investors and entrepreneurs’ characteristics as well as contingent (improvisational) entrepreneurs actions.

Our results show projects which achieve the early momentum of funding are more likely to lead to the positive performance. Sound projects may lead an early momentum of funding under the information asymmetry condition or the early momentum enables entrepreneurs to focus on preparing their innovation earlier in the fundraising stage than others. Such a virtuous circle leads to positive entrepreneurial execution performance. Also, prior studies show that funding early in the campaign is mainly driven by friends and families or experts who have more knowledge about projects (Agrawal, Catalini, and Goldfarb, 2013). In contrast, the late hype-funding model (without building early momentum) negatively influences projects’ performance, because of the lack of entrepreneurs' preparation, an unexpected demand for outcome, and the inherent low quality of projects and entrepreneurs’ performance. This explains the process by which entrepreneurs generate heterogeneous value and in their ability to survive given ostensibly similar resources (in this case, total amounts of funding). Our finding offers novel and important implications for the theory and practice of the projects performance in crowdfunding platforms.
This is the first study that investigates the fundraising patterns and their impacts on crowdfunding projects’ performance. Using entrepreneurship theory and bandwagon effects as a theoretical lens, we examine which fundraising dynamics enhance or hinder entrepreneurs’ project performance in IT enabled funding platforms. We have emphasized that in order for entrepreneurs to achieve better performance they need to gain legitimacy and access to resources early in the fundraising stage. By doing this, they can reduce the burden of resource dependency and focus on their existing resource and internal execution capabilities. We also conceptualize the dynamics of fundraising patterns and associated underlying mechanisms. Furthermore, we empirically examine the impacts of evolutionary patterns on projects performance, which will contribute to crowdfunding research. Our findings also represent the evidence of potential problems in the crowdfunding platform. Although new digital platforms create new opportunities for start-ups, the social evaluation mechanism and severe information asymmetry can often cause adverse selection problems in which sound quality entrepreneurs or projects cannot get funding, and low quality projects can attract funding but the entrepreneurs do not have capability or resources to achieve their initial goals. This negative performance directly hurts the reputation of entrepreneurs and opportunity on firm survival, but also changes individuals’ funding behaviors.

Our finding not only has the potential to enrich the stream of research on crowdfunding but also provide managerial implications for entrepreneurs’ performance and contingent actions in crowdfunding platforms. This study provides several managerial implications for both start-ups who want to raise funds and investors who contribute to projects and seek sound projects in crowdfunding platform. Entrepreneurs should emphasize their prior performance, if it does not exist, they should increase their early visibility using social media tools to obtain earlier momentum. Potential investors should not simply follow others’ funding behaviors especially in the very late stage. Investors should look the dynamic patterns of funding; review the indicators of projects’ and entrepreneurs’ quality, because irrational bandwagon behavior could lead negative performance which could hurt the start-up itself and waste investors’ money. We expect that our work will contribute to and promote future research that enhances our understanding of crowdfunding participation and performance regarding resource access and new firm creation.

This research is a work-in-progress. Our future version of research will address a few more things. First, we will consider different innovation or new project development performance measures, while the delivery of outcome is an initial performance measure in the crowdfunding market. Commercialization and actual sales revenue can be potential candidates of the performance. Additionally, in many cases delays are also caused by unexpected external things such as shipping problems, legal screenings, and so on. In our future study, it is valuable to consider how entrepreneurs cope with these issues. In our study, we focused on a reward-based crowdfunding platform which funders do not have an equity stake in the project. It will be interesting to investigate different fundraising patterns and the relationship between fundraising patterns and performance whether exist in the other types of funding methods. Additionally, to eliminate possible alternative explanations and endogeneity issues, we will examine additional empirical models which include interaction effects between entrepreneurs and projects characteristics, fundraising patterns along with other online dynamic relationships, and will test whether selection bias exist. More granular analyses will allow us to provide a richer explanation about the fundraising dynamics and entrepreneurs’ performance in the digital funding platforms.

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