Cilt/Volume 10 | Sayı/Issue 1 | Haziran/June 2021 | 53-80

Scientists' Technology Acceptance of Crowdfunding in Turkey: The Moderating Effect of Individual Entrepreneurial Orientation

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ABSTRACT

Purpose: The purpose of the empirical study is to test the technology acceptance model constructs in the context of science crowdfunding with the moderating effect of Individual Entrepreneurial Orientation.

Methodology: The study tested the relationships between technology acceptance model constructs with the moderating effect of Individual Entrepreneurial Orientation with path analysis. 152 valid responses were gathered from an online survey conducted between September 2019- February 2020 and the data was analysed with Smart PLS 3.0 software.

Findings: The results show that the performance expectancy has a positive effect on the behavioural intention to use science crowdfunding. Moreover, social influence has the strongest effect on the behavioural intention. Regarding the interaction effects, when the academics possess more innovativeness, risk-taking and proactiveness thus individual entrepreneurial orientation exists, the effect of social influence on the behavioral intention is much stronger

Practical Implications: The overall structural model suggests that in a limited research funding environment, when academics are exposed to science crowdfunding options in a positive and systematic manner, they might be open for starting crowdfunding research projects in this medium because of the social influence. If the academics possess an entrepreneurial profile, they will engage more in the science crowdfunding efforts, which may be effective in the project funding success.

Originality: Although entrepreneurial orientation has been used to explain technology acceptance behaviour and technology acceptance model has been used to understand crowdfunding behaviour, this study is the first initiative to measure how individual entrepreneurial orientation of academics will shape their technology acceptance behaviour in science crowdfunding which is critical for entrepreneurial academics to access alternative funds in order to eliminate financial constraints for their innovative and entrepreneurial endeavours.

Keywords: Academic Entrepreneurship, Crowdfunding, Technology Acceptance Model, Digital Transformation, Resource Dependency.

JEL Codes: O30, O32, O36, M10.

Türkiye'de Kitle Fonlamasının Bilim İnsanları Tarafından Teknoloji Kabulü: Bireysel Girişimcilik Eğiliminin Düzenleyici Etkisi

ÖZ

Amaç: Bu ampirik çalışmanın amacı, Bireysel Girişimcilik Eğiliminin düzenleyici etkisi ile bilim kitle fonlaması bağlamında teknoloji kabul modeli yapılarını test etmektir.

Yöntem: Çalışma, yol analizi ile Bireysel Girişimcilik Eğiliminin düzenleyici etkisi ile teknoloji kabul modeli yapıları arasındaki ilişkileri test etmiştir. Eylül 2019-Şubat 2020 arasında gerçekleştirilen çevrimiçi bir anketten 152 geçerli yanıt toplanmış ve veriler Smart PLS 3.0 yazılımı ile analiz edilmiştir.

Bulgular: Sonuçlar, performans beklentisinin, bilim kitle fonlamasını kullanma davranışsal niyeti üzerinde olumlu bir etkiye sahip olduğunu göstermektedir. Dahası, sosyal etki davranışsal niyet üzerinde en güçlü etkiye sahiptir. Düzenleyici değişkenlerin etkileri ile ilgili olarak, akademisyenler daha fazla yenilikçiliğe, risk almaya ve proaktiviteye sahip olduklarında ve dolayısıyla bireysel girişimci yönelimi olduğunda, sosyal etkinin davranışsal niyet üzerindeki etkisi çok daha güçlüdür.

Sonuç ve Öneriler: Genel yapısal model, sınırlı bir araştırma fonu ortamında, akademisyenler pozitif ve sistematik bir şekilde bilim kitle fonlaması seçeneklerine maruz kaldıklarında, sosyal etkinin bir sonucu olarak bu ortamda kitle fonlaması araştırma projeleri başlatmaya açık olabileceklerini göstermektedir. Akademisyenler girişimci bir profile sahipse, proje finansmanı başarısında etkili olabilecek bilim kitle fonlaması çabalarına daha fazla katılırlar.

Özgün Değer: Daha önceki çalışmalarda her ne kadar teknoloji kabul davranışını açıklamak için girişimcilik eğilimi kullanılmış ve kitle fonlaması davranışını anlamak için teknoloji kabul modeli kullanılmış olsa da, bu çalışma akademisyenlerin bireysel girişimcilik eğilimlerinin bilim kitle fonlamasında teknoloji kabul davranışlarını nasıl şekillendireceğini ölçen için ilk çalışmadır. Çalışma, girişimci akademisyenlerin yenilikçi ve girişimci çabalarında finansal kısıtlamaları ortadan kaldırmaya yönelik olarak, alternatif fonlara erişmeleri için kritik öneme sahiptir.

Anahtar Kelimeler: Teknoloji Kabulü, Kitle Fonlaması, Akademik Girişimcilik, Dijital Dönüşüm, Kaynak Bağımlılığı.

JEL Sınıflandırması: O30, O32, O36, M10.

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Araştırma Makalesi (Research Article)
Geliş (Submitted) : 20/10/2020
Düzeltme (Revision) : 03/03/2021, 07/05/2021
Kabul (Accepted) : 09/05/2021

1. Introduction

The resource need of organizations is an important variable that shapes organizational decisions and competitiveness. These resources can be either financial, human resources, information or social (Doyle et al., 2016). When Resource Dependence Theory (RDT) was brought to the management and organization literature by Pfeffer and Salancik (1978), arguing that the dependency of an organization to the external resources has an influence on the decisions of management and productivity of the organization, it made a significant contribution. As such, the more the organizations diversify their resources and reduce their resource dependency, the more they gain competitive advantage and achieve sustainability. If the resources that the organization need in the environment are limited or under the control of few groups, the dependence of the organization to those resources and their owners will increase (Nienhüser, 2008) and the power of the organization will diminish (Malatesta and Smith, 2014).

The funding resources of scholars in universities or research institutes are basically gathered under three main headings, including the institution's self-resources, public funds (including NGOs) and private sector funds. Since the self-resources of the scientific institutions are limited, scholars should seek public or private funds to sustain the financial resources they need to fund their research projects. Within the perspective of the resource dependency, the conservation of the resources leads to higher dependency while affecting the research fields and methodologies of the scholars directly. Therefore, the scholars and institutions are seeking alternative funding resources (Powers, 2003).

Pfeffer and Salancik (2003:44) indicated that the hypothesis on the center of RDT is that the one who has the resources has the control of the one who needs those resources. So, when scholars change their suppliers for the funding of their research, the power that controls the aim and the focus of research will be changed. Scholars, like organizations, will act to reduce the uncertainty of the environment and gain control of resources to reduce the dependency. Therefore, they may opt for alternative funding methods such as crowdfunding.

Each source of funds will lead to a different level of dependence. Especially in scientific research that are mostly non-profit projects, the environmental uncertainty and hence resource dependence can be high (Sacristán López de Los Mozos, Rodríguez Duarte, and Rodríguez Ruiz, 2016). The asymmetric dependence approach which is one of two approaches of RDT is significant in terms of the

funding model of the scientific research. This approach states that key resource providers have the power to influence the organization's structure and decisions.

The focus and framework of scientific research are mostly set up within the scope of the goals and expectations of the fund providers. On the other hand, the relationship between scholars and resources can also be explained by joint dependency approach (Gulati and Sytch, 2007; Hillman et al., 2009; Villanueva, Van de Ven and Sapienza, 2012). This approach argues that an organization can have mutual dependence on each side, rather than the dominance of on side in its dependence on the other. When considered in this context, institutions or organizations that provide resources to scientific research, often desire the realization of the research they need in accordance with their goals. Since conducting these projects in the house is not effective for most cases, they can be considered dependent on scholars and their research capabilities (Pfeffer and Salancik, 2003).

Due to the limited number of public and university grants in many countries, researchers are focusing on funding opportunities from the private sector, bringing together various discussions (Goldfarb, 2008). While it is argued that research funded by private sector gains closer ties with the industry (Bozeman and Gaughan, 2007; Muscio et al., 2013) on the other hand, this resource dependency may lead researchers to focus on the expectations of funders and may weaken research independence.

On the other hand, digitalization has revealed new ways of communication and interaction affects all societies. Academia is among the group that takes advantage of this transformation. Along with digital tools, where new ways of creating common sense and collaborating are discovered, the scholars also have begun using alternative funding models to expand funding sources while reducing resource dependency to traditional actors of funding (Bouncken and Komorek, 2015). As a collaborative digital community, for the people of the modern world being involved in the knowledge and its production process has become an important value. At this point, the crowdfunding, which democratized access to finance, emerged as an alternative funding model that supports collaboration, involvement, and sharing (Mollick and Robb, 2016; Fehrer and Nenonen, 2019).

After successful examples of the use of crowdfunding by technology entrepreneurs, the users of the method spread from culture to art, from social initiative projects to scientific research (Brem et al., 2019). According to Statis-

ta.com, the transaction value of worldwide crowdfunding activities is around $7 billion in 2019 with 8.724 campaigns (Statista Market Forecast, 2019). One of the most significant differences between the traditional financing methods and crowdfunding is that crowdfunding allows projects to be supported by the whole community, even if they do not have any expertise or direct interest in the subject or area of the project (Vachelard et al., 2016).

Some recent scholarly studies (Rippa and Secundo, 2018) addressed the gap in research investigating the impact of Digital on Academic Entrepreneurship and called for exploring the potential of digital technologies through rationale, processes, and forms. As academics rely on funding for research, scientists' technology acceptance behaviour of new technologies related to funding can be tied to their entrepreneurial endeavours thus articulates a preeminent research topic to investigate at the nexus of "Academic entrepreneurship" "Digitalization", and "Science Crowdfunding".

Technology acceptance model is broadly applicable in Information Technology (IT) contexts regarding its explanatory power in understanding acceptance of systems and technologies and validated psychometric measurement scales (Yousafzai et al., 2007). The concept has developed through an evolutionary process, resulting in different applications in different contexts and through relevant constructs. One of them is understanding the effect of entrepreneurial orientation on technology acceptance behaviour. As one of the dimensions of entrepreneurial orientation, previous studies showed that "personal innovativeness" provided a valid extension of user technology acceptance behaviour (Jackson et al., 2013).

The aim of this empirical paper is to understand the effect of technology acceptance of science crowdfunding constructs namely as "performance expectancy, effort expectancy, social influence and facilitating conditions" on the intention to use science crowdfunding among academics and how individual entrepreneurial orientation moderates this effect. Technology acceptance model' s evolution and extensions were primarily discussed, resulting in a comprehensive framework for science crowdfunding to be tested for the hypothesized relationships.

The paper is organized as follows: Section 2 will provide the literature review on the theoretical background about, Science Crowdfunding, Technology Acceptance, and individual Entrepreneurial Orientation. Section 3 reveals the metho-

dology for the empirical investigation, and Section 4 delivers the findings of the tested hypothetical relationships. Section 5 concludes the model and elaborates room for further research.

2. Theoretical Background

2.1. Science Crowdfunding

Science crowdfunding is a new era for science communication nominating public as the evaluator of a scientific project to assess trust and value. The crowdfunding process closes the gap between scientists and audience introducing the society's interests and direction into the process. Restriction in research budgets is a common phenomenon in public funds all over the world. Science crowdfunding is sourcing financial support from the crowd in order to carry out scientific projects (Hui and Gerber, 2015).

There are major differences between science crowdfunding and traditional funding. The projects should have an appeal to create interest among the general public, it should be easy to understand, it should be public-friendly, it uses multimedia content, it should be evaluated by the public in exchange for crowdfunding (Hui and Gerber, 2015). The crowdfunding scientist should be equipped to carry out many activities including videocast, social media management, regular informing sessions for progress and reaching out to the community for answering questions back compared to traditional funding' s peer review scheme implying a complex workload and increased concern over exposure (Ikkatai et al., 2018). The amount raised is related to the scientist's audience and performance on social media (Siva, 2014) which is extraordinary for a regular scientist (Siva, 2014). On the other hand, traditional grant mechanisms are not free from efforts, in fact, they require a very concrete proposal content based on preliminary studies (Dahlhausen et al., 2016).

It creates conflict to some extent that some platforms try to adopt peer review processes to guarantee the scientific value of the crowdfunding project. More concerns are raised since outlier original projects will be absorbed by the traditional peer review mindset leading to the elimination of with prejudice and bias, the capacity of the government to award genuine projects is being questioned (Osimo et al., 2016). On the other hand, peer review might function as quality assurance and disabling fake science projects (Ikkatai et al., 2018).

Crowded science is an incentive for more society-oriented scientific activities getting support and engagement from the community. The goal is the advancement of scientific knowledge and dissemination of results through society. According to studies (Hui and Gerber, 2015), majority of crowdfunding scientists 58% are post-doc, graduate and undergraduate researchers who might be claimed to be familiar with science communication, multimedia technologies and social media more than senior scientists.

Science Communication is another related artefact to science crowdfunding. Byrnes *et al.* (2014) defined science communication as scientists' engagement activities with the public to create awareness, interest, and understanding about their research. However, it did not create enthusiasm among most scientists; promotion did not recognize public outreach efforts, in fact, it has been recognized as a barrier to productivity and risk for reputation. On the other hand, digital communication outlets emerged, traditional gateways were removed, and scientists are exposed to their audience through blogs, websites, online speeches. A crowdfunding platform is a medium for validating the face value of a scientific project and showcase of innovations triggering marketing and public relations of the projects, it is a constant time and effort investment in scientific outreach (Vachelard et al., 2016).

Scientific community and society support science crowdfunding due to several reasons (Wheat et al., 2013; Byrnes et al., 2014; Siva, 2014; Osimo et al., 2016; Sauermann et al., 2019):

- Cuts on traditional funding and raise of competition for limited amounts can be overcome with crowdfunding by increasing the resource alternatives.
- The Crowd might be interested in encouraging and financing junior scientists without an established track record and established network.
- The Crowd might be interested in encouraging and financing non-mainstream projects.
- Crowdfunding develops public science literacy.
- Crowdfunding is rewarding for scientists beyond monetary gains such as community building.
- Crowdfunding eliminates bureaucracy and cost burden on the funding process.

Some universities proactively started to coordinate science crowdfunding activities for their faculty. Crowdfunding is not a substitution but a necessary and critical form of democratic funding (Gaggioli and Riva, 2008; Weigmann, 2013). Science crowdfunding scene is different from concrete product/reward based systems (Weigmann, 2013) as the supporters engage in supporting Scientists, not research outcomes. A common concern is that only "Panda Bear Science" which refers to populist and attractive projects with a public appeal would attract crowdfunding (Byrnes et al., 2014). In order to prevent misuse of platforms, a funding proposal mechanism and affiliation inquiry are still adapted (Siva, 2014). Hawkes and Thomson (2015) claimed that concerns raised over the risk of backing studies that are of limited importance and applicability are the most important feature of crowdfunding as it will support investigating rare and emerging topics. However, research ethics acknowledges that most widely accepted and critical research must be granted when resources are limited (del Savio, 2017). Another risk associated with crowdfunding is that media manipulation may trigger emotional backers even if any scientific development does not exist such as the case of fake cures for seldom diseases (Perlstein, 2013).

2.2. Entrepreneurial Orientation

The concept first brought in literature by David Miller (1983) without using the specific name "Entrepreneurial Orientation" (EO) but with three dimensions as; innovativeness, proactiveness, and risk-taking to explain the connection of innovativeness and market success of a company with its entrepreneurial skills (Miller, 1983). Furtherly, the original model was modified by Lumpkin and Dess (1996) with two additional dimensions as autonomy and competitive aggressiveness. In a recent study, (Anderson et al., 2015) reconceptualized EO as a multidimensional construct and added two more dimensions to the model which are entrepreneurial behaviors and managerial attitude toward risk (see Table I). The relationship between entrepreneurship and company performance is an important research topic for scholars (Zahra, 1993). Researchers argue that companies with a high entrepreneurial orientation are more likely to enter new markets and expand the market share (Lumpkin and Dess, 1996; Walter et al., 2006; Zahra, 1993). Consequently, EO is a highly popular concept especially for management researchers who investigate the connections between EO level, firm performance and corporate entrepreneurship (Wiklund, 1999; Dess and Lumpkin, 2005; Cho and Lee, 2018).

Table 1. EO dimensions by models and definitions adopted from Lumpkin and Dess, (1996), Rauch et al. (2009), Anderson et al. (2015).

Model Origin	Dimension	Definition
Miller (1983)	Innovativeness	Predisposition to engagement in creativity and experimentation through the introduction of new products/services and through technological leadership via research and development.
	Proactiveness	An opportunity-seeking, forward-looking perspective characterized by new product and services ahead of the competition and acting in anticipation of future demand.
	Risk-taking	Involves taking bold actions by venturing into the unknown, borrowing heavily and/or, committing significant resources to ventures in uncertain environments.
Lumpkin and Dess (1996)	Autonomy	Is an independent action undertaken by entrepreneurial leaders or teams directed at bringing about a new venture and seeing it to fruition?
	Competitive Aggressiveness	Refers to the type of intensity and head-to-head posturing that new entrants often need to compete with existing rivals.
Anderson et al. (2015)	Entrepreneurial Behaviors	Firm-level pursuit of a new product, processes, or business models.
	Managerial Attitude	Inherent managerial inclination favoring strategic actions that have uncertain outcomes.

Although the arguments around the theoretical conceptualization of EO are still up to date (Covin and Lumpkin 2011), two main fragments that reflect the literature are EO as a firm-level attribution and EO as an individual-level attribution. After the success of measuring the relationships between EO and firm performance, another spot has been directed to the individual level of EO to measure the relationship between individual entrepreneurial success and EO dimensions (Kollmann, Christofor and Kuckertz, 2007; Langkamp Bolton and Lane, 2012; Robinson and Stubberud, 2014; Koe, 2016). Since the original concept of EO is not constructed for an individual base measurement, additional measurement development research was conducted by Langkamp Bolton and Lane (2012) and validated with three dimensions as risk-taking, innovativeness,

and proactiveness representing the constructs of individual entrepreneurship orientation (IEO).

2.3. Technology Acceptance Model

Technology acceptance model developed by Davis et al., (1989) is used to explain the bases of user acceptance of technologies relying on a set of factors such as perceived usefulness and perceived ease of use. It traces back to the Theory of Reasoned Action (Ajzen and Fishbein, 1977) which converged with different domains of research such as Theory of Planned Behaviour (Ajzen, 1985), Diffusion of Innovations (Rogers Everett, 1995) and evolved into alternative models such as Technology Acceptance Model 2 (TAM2) (Venkatesh and Davis, 2000), Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh *et al.*, 2003), Technology Acceptance Model 3 (TAM3) (Venkatesh and Bala, 2008) and UTAUT 2 (Rondan-Cataluña, Arenas-Gaitán and Ramírez-Correa, 2015). The extension and modified models focused on the predictors of intention and cross effects to explain technology acceptance behaviour dynamics (see Table 2).

As (Gupta et al., 2016) addressed in their study, individual entrepreneurial orientation is a neglected factor in technology acceptance research. Individual Entrepreneurial Orientation was applied in technology acceptance model by Gupta et al. (2016) and results showed that incorporating the variable of IEO has explained an additional 24.3% variance in technology adoption. In the context of academic entrepreneurship, technology acceptance of crowdfunding can be moderated by the individual entrepreneurial orientation of faculty members. Dimensions of individual entrepreneurial orientation for technology acceptance of science crowdfunding can be furtherly elaborated as such: Proactiveness is nominated as the scientist's ability and willingness to pursue opportunity-seeking behaviour to diversify the resource base while overcoming the organizational constraints. Innovativeness is the scientist's ability to create novel solutions to challenges, in this case, crowdfunding is an innovative behaviour to meet traditional funding challenges. Risk taking is the willingness of the scientist to take decisions and actions which may result in failure with a reasonable chance which means crowdfunding may result not in favour of the scientist.

Table 2. Technology acceptance models and extension/evolution/application

TAM (Davis, 1986)	The original model focused on perceived usefulness and perceived ease of use lacking rigor in terms of explaining the power of intention and behaviour (Yousafzai et al., 2007)
TAM 2 (Venkatesh and Davis, 2000)	Extended the original TAM detailing perceived usefulness and usage intentions in terms of social influence (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, perceived ease of use). The extended model was applied in voluntary and mandatory settings.
UTAUT (Venkatesh et al., 2003)	Designed for organizational settings, regarding employees adopting a new system for increased productivity and job performance (Savolainen, 2016); highlighted facilitating conditions such as organizational infrastructure.
TAM 3 (Venkatesh and Bala, 2008)	Extended TAM 2 detailing perceived ease of use in terms of anchor (computer self-efficacy, perceptions of external control, computer anxiety, computer playfulness) and adjustment (perceived enjoyment, objective usability) focusing the real experience of the respondent.
UTAUT 2 (Venkatesh et al., 2012)	Applicable in the context of consumer technologies including new constructs added to UTAUT such as hedonic motivation, price value, and habit (Rondan-Cataluña et al., 2015)
UTAUT for Studying Different Variables/Moderating Effects	A meta-analysis of TAM showed that perceived ease of use and perceived usability are affected by variables in four categories as (Yousafzai et al., 2007)
Studying Specific Applications	Applicable in different scenarios (Lee et al., 2003; Vogelsang et al., 2013)
Entrepreneurial Orientation (Lumpkin and Dess, 1996), Individual Entrepreneurial Orientation (Langkamp Bolton and Lane, 2012)	Gupta et al. (2016) investigated the moderating role of Entrepreneurial Orientation in mandatory context and results showed a significant interaction effect on technology acceptance.

3. Research Model and Hypotheses

3.1. Deconstructing Technology Acceptance Models for Science Crowdfunding

Scholarly research on technology acceptance usually analyse suitable constructs derived from existing theories and/ or frameworks hypothesizing relationships in a new model (Vogelsang et al., 2013). Following the evolution/extension/application variations of technology acceptance model, the paper deconstructed

the variables, discussed through the lens of science crowdfunding, and elaborated the most suitable model applicable in science crowdfunding settings.

- *TAM 1:* Technology acceptance model shows a promising foundation for evaluating academics' approach to science crowdfunding, as the science crowdfunding system success is highly dependent on the intention of academics to use it effectively. Crowdfunding is complex, uncertain, and risky to some extent as it involves developing new skill sets and understanding in science communication.
    - As the main building block of TAM (Yousafzai et al., 2007), perceived usefulness is the "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320) in an organizational context. Perceived usefulness relates to scientists' efforts to raise funding for their research and how science crowdfunding can enhance the initiatives. Restriction in research budgets is a common phenomenon in public funds all over the world. Science crowdfunding is sourcing financial support from the crowd in order to carry out scientific projects (Hui and Gerber, 2015).
    - Moreover, as another block of TAM, perceived ease of use focuses on the subjective understanding of how easy it is to use the system considering the end-user' s capabilities. There are major differences between science crowdfunding and traditional funding. The projects should have an appeal to create interest among the general public, it should be easy to understand, it should be public-friendly, it uses multimedia content, it should be evaluated by the public in exchange for crowdfunding (Hui and Gerber, 2015). Scientists' individual beliefs that using the science crowdfunding system would be free from efforts such as developing skills for campaign management will increase their perceived ease of use. Moreover, Venkatesh (1999) showed that game-based training for technology use results in greater adoption of technology compared to traditional training.
- *TAM 2* extended the original TAM detailing perceived usefulness and usage intentions in terms of social influence (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, perceived ease of use). The extended model was applied in voluntary and mandatory settings.

- Subjective norm is the degree to which the scientist perceives that people who are important to her/him think he/she should or should not use the science crowdfunding. Regarding ethical concerns and risk associated with science crowdfunding, the academic community might be expected to approach it with suspicion.
- Image is the degree to which the scientist perceives that using science crowdfunding will leverage his status in the academic community. Raising research funds without a peer review mechanism might be considered as scientific inferiority by the scientist which he/she would not be interested in using crowdfunding. On the other hand, it might trigger an entrepreneurial image to be exposed to the community for crowdfunding.
- Job Relevance is related to the belief of the scientist about the applicability of the science crowdfunding to his/her academic job.
- Output Quality is related to the belief of the scientist about task performance as science crowdfunding worked well.
- Result Demonstrability is related to the belief of the scientist that the results of using science crowdfunding are tangible, observable, and communicable.

- *TAM 3* extended TAM 2 detailing perceived ease of use in terms of anchor (computer self-efficacy, perceptions of external control, computer anxiety, computer playfulness) and adjustment (perceived enjoyment, objective usability) focusing the real experience of the respondent. Selected constructs are discussed below.
  - Computer self-efficacy is related to the scientist' belief about his/her ability to apply, conduct and complete a science crowdfunding project online.
  - Perception of external control refers to scientists' belief about the support of the larger context for using the system such as organizational support or technological infrastructure support.
- A meta-analysis of technology acceptance model shows different variables affecting perceived ease of use and perceived usefulness (Yousafzai et al., 2007). The research categorized the variables in four categories: organizational characteristics, system characteristics, user personal characteristics, and other variables. Elaborating the specific variables applicable to science

crowdfunding are included in table II nominating "Group' s Innovativeness Norm" as the dimension of Social Influence, "Perceived Complexity" as the dimension of Effort Expectancy, and "Personal Innovativeness" as the dimension of Individual Entrepreneurial Orientation.

Table 3. Different moderating Variables in TAM adopted from Yousafzai et al. (2007)

Organizational Characteristics	**Organizational Policies**
	Organizational Usage
	Peer Influence
	Peer Usage
	Training
	Transitional Support
	Competitive Environment
	Group' s innovativeness norm
System Characteristics	Convenience
	Image/Interface
	Navigation
	Perceived Complexity
	Reliability and Accuracy
	Trialability
	Web security
User Personal Characteristics	Age
	Awareness
	Educational Level
	Experience
	Gender
	Personal Innovativeness
	Skills and Knowledge
	Trust
	Voluntariness
Other Variables	Argument for Change
	Vendor' s cooperation
	Task-technology fit

- *UTAUT* (Venkatesh et al., 2003) was applied in several studies conducted in order to analyse technology acceptance of crowdfunding. Savolainen (2016) approached equity crowdfunding potential investors using the constructs of usefulness, ease of use, self-efficacy, facilitating conditions, social influence, attitude, behavioural control, intention, trust, reputation, information quality, system quality, demographic factors. The research showed that attitude is the strongest predictor of adoption intention which is most affected by "Trust".
    - o Performance expectancy is the scientist' s belief about how using the system will help attain gains in job performance.
    - o Effort expectancy is the combination of perceived ease of use and complexity.
    - o Social influence is the combined notion of subjective norm and image.
    - o Facilitating conditions refer to perceived enabling or disabling factors in the environment which means the availability of supporting organizational and technological factors will facilitate perception of external control and technology adoption behaviour.

3.2. Research Model for Technology Acceptance in Science Crowdfunding

As the most preeminent model for technology acceptance, the paper adopted the UTAUT framework for science crowdfunding. In this context, performance expectancy is nominated on the building blocks of fundraising and science communication activities of the Scientist. Effort expectancy relates to scientist' s dispositions about the system complexity and relevant skill development and campaign management efforts. Social influence is elaborated on the group's innovativeness norm and image. Facilitating conditions are perceived as organizational and technological support (Figure 1).

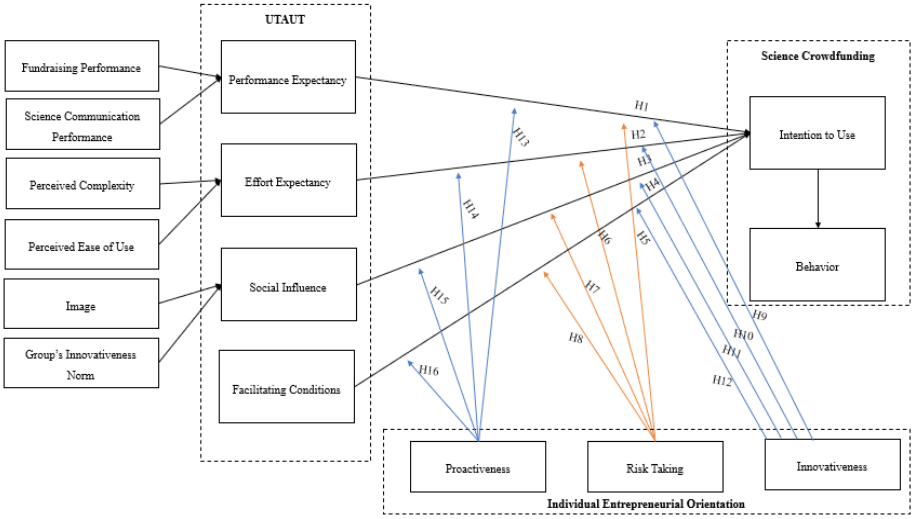

Figure 1. Research model

H_1: There is a direct positive relationship between performance expectancy and intention to use science crowdfunding.

H_2: There is a direct positive relationship between effort expectancy and intention to use science crowdfunding.

H_3: There is a direct positive relationship between social influence and intention to use science crowdfunding.

H_4: There is a direct positive relationship between facilitating conditions and intention to use science crowdfunding.

H_5: The higher risk-taking of the scientist strengthens the positive relationship between performance expectancy and intention to use science crowdfunding.

H_6: The higher risk-taking of the scientist strengthens the positive relationship between effort expectancy and intention to use science crowdfunding.

H_7: The higher risk-taking of the scientist strengthens the positive relationship between social influence and intention to use science crowdfunding.

H_8: The higher risk-taking of the scientist strengthens the positive relationship between facilitating conditions and intention to use science crowdfunding.

H_9: The higher innovativeness of the scientist strengthens the positive relationship between performance expectancy and intention to use science crowdfunding.

H_{10}: The higher innovativeness of the scientist strengthens the positive relationship between effort expectancy and intention to use science crowdfunding.

H_{11}: The higher innovativeness of the scientist strengthens the positive relationship between social influence and intention to use science crowdfunding.

H_{12}: The higher innovativeness of the scientist strengthens the positive relationship between facilitating conditions and intention to use science crowdfunding.

H_{13}: The higher proactiveness of the scientist strengthens the positive relationship between performance expectancy and intention to use science crowdfunding.

H_{14}: The higher proactiveness of the scientist strengthens the positive relationship between effort expectancy and intention to use science crowdfunding.

H_{15}: The higher proactiveness of the scientist strengthens the positive relationship between social influence and intention to use science crowdfunding.

H_{16}: The higher proactiveness of the scientist strengthens the positive relationship between facilitating conditions and intention to use science crowdfunding.

4. Methodology

The study adopted online survey as the data collection method. The Questionnaires included The UTAUT questionnaire (Unified Theory of Acceptance and Use of Technology) that was developed by Venkatesh et al. (2003) and translated into Turkish by Yılmaz and Kavanoz (2017). UTAUT constructs (performance expectancy, effort expectancy, social influence, facilitating conditions, and intenti-

on to use crowdfunding) was analysed through path analysis with SmartPLS 3.0 software with the moderating effect of Individual Entrepreneurial Orientation (Özdoğan, 2020). The items were measured on a Likert type scale ranging from 1-Strongly Disagree to 5- Strongly Agree.

The paper adopted non-probability convenience sampling through the academic social networks of the researchers and 152 valid responses were gathered from an online survey conducted between September 2019- February 2020. As the data protection rules do not allow for mass e-mailing the mail addresses collected from the web, non-probability convenience sampling was adopted. We identified scientists from five academic disciplines in Turkey as the population of the study, including Health Sciences, Social Sciences, Technical Sciences, Sciences, and Agricultural Sciences, officially listed as field taxonomies by TUBITAK (The Scientific and Technological Research Council of Turkey). 152 responses represent 59,9 % male, and 40,1% female academics; 19,1% professors, 18,4 % associate professors, 33,6 % assistant professors, 7,4 % research assistant or lecturer with Ph.D., 9,9 % graduate level student in academy, 9,9% graduate level student out of academy; 74,3% social sciences and humanities, 10,5 % technical sciences, 8,6% basic sciences, 0,7% agricultural sciences, and 5,9% health sciences.

We adopted partial least squares structural equation modelling based on the small sample data (152). We tested the path model with Smart PLS 3.0 and assessed the reliability and validity of the measurement model, and tested our hypotheses as suggested by the relevant methodology literature (Ringle et al., 2012; Garson, 2016; Hair et al., 2016; Henseler et al., 2016; Szász and Seer, 2018).

5. Findings

5.1. Measurement Model Analysis

After the first run of factor analysis, the item K2 with the VIF value of 6,216 was removed from the model for collinearity. After the second run, the item K10 with the VIF value of 5,893 was removed from the model for collinearity. In the third model, VIF statistics were within the acceptable range of <5, factors were loaded with over 0,7 values with predetermined items. Constructs are reliable with Cronbach alpha>0,70; RhoA>0,70; CR>0,70; AVE>0,50 (Table 4). Discriminant analysis was run and confirmed (Table 5).

Table 4. Measurement model results

Factors	Construct Items	Loadings	Cronbach's Alpha	rho_A	CR	AVE
Performance Expectancy	KF1	0,922	0,886	0,900	0,929	0,814
	KF3	0,877				
	KF4	0,907				
Effort Expectancy	KF5	0,757	0,831	0,844	0,886	0,661
	KF6	0,832				
	KF7	0,816				
	KF8	0,845				
Social Influence	KF9	0,950	0,887	0,888	0,946	0,898
	KF11	0,946				
Facilitating Conditions	KF12	0,815	0,829	0,858	0,896	0,741
	KF13	0,900				
	KF14	0,866				
Proactiveness	P1	0,804	0,901	0,918	0,926	0,717
	P2	0,758				
	P3	0,907				
	P4	0,900				
	P5	0,855				
Risk-taking	R1	0,823	0,789	0,789	0,877	0,703
	R2	0,849				
	R3	0,844				
Innovativeness	Y1	0,857	0,825	0,859	0,882	0,654
	Y2	0,866				
	Y3	0,678				
	Y4	0,819				

Table 5. Discriminant validity

	Effort Expectancy	Facilitating Conditions	Innovativeness	Performance Expectancy	Proactiveness	Risk-taking	Social Influence	Behavioral Intention
Effort Expectancy	**0,813**							
Facilitating Conditions	0,593	**0,861**						
Innovativeness	0,361	0,191	**0,809**					
Performance Expectancy	0,672	0,316	0,346	**0,902**				
Proactiveness	0,393	0,302	0,709	0,378	**0,847**			
Risk-taking	0,179	0,055	0,454	0,232	0,425	**0,839**		
Social Influence	0,536	0,386	0,214	0,561	0,161	0,092	**0,948**	
Behavioral Intention	0,661	0,485	0,334	0,668	0,411	0,253	0,649	**0,923**

5.2. Structural Model Results

We adopted the bootstrapping method for hypothesis testing and Table 6 and Table 7 present the results for main effects and interaction (moderating) effects. As t-values greater than 2,58 represent significance on the 1% level, decisions of support or rejection was based on relevant T-statistics.

Table 6. Main effects results

Hypotheses	T Statistics (|O/STDEV|)	P Values	Decision
H_1 **Performance Expectancy -> behavioral intention**	2,895	0,004	**Supported**
H_2 **Effort Expectancy -> behavioral intention**	1,490	0,137	Rejected
H_3 **Social Influence -> behavioral intention**	4,636	0,000	**Supported**
H_4 **Facilitating Conditions -> behavioral intention**	1,450	0,147	Rejected

Table 7. Interaction effects results

Hypotheses	T Statistics (|O/STDEV|)	P Values	Decision
H_{13} **PExPRO -> behavioral intention**	0,555	0,579	Rejected
H_{5} **PExRISK -> behavioral intention**	0,738	0,461	Rejected
H_{9} **PExINNO -> behavioral intention**	1,532	0,126	Rejected
H_{15} **SOCxPRO -> behavioral intention**	2,655	0,008	**Supported**
H_{7} **SOCxRISK -> behavioral intention**	2,255	0,024	**Supported**
H_{11} **SOCxINNO -> behavioral intention**	3,273	0,001	**Supported**

6. Discussion

As the main effects results have shown, performance expectancy has a positive effect on the behavioral intention of using science crowdfunding. Moreover, social influence has the strongest effect on the behavioral intention. We had defined performance expectancy as the scientist' s belief about how using the system will help attain gains in job performance. Job performance is related to the scientists' efforts to raise funding for their research in the context of this research. In this vein, it is supported that crowdfunding research projects have great potential for scholars to create a supplementary funding source to traditional sources like government and private sector funds as well as creating an opportunity for citizen involvement in science (Cameron et al., 2013; Lau et al., 2016). The process of promoting and requesting funding scientific researches through crowdsourcing has different contributions to the scholars as assessing the accuracy of research goals in terms of public expectations and enhancing the communication process except that researchers have access to the funding resources they need (Wheat et al., 2013).

To have a successful campaign and reach the funding goals in crowdfunding of a scientific project, scholars must follow different approaches than they do in traditional funding methods. To be specific, since the funders in crowdfunding are not always experts in the field, the language of the campaign and the way of communication should be managed accordingly. On the other hand, reaching the right people for the campaign from a massive crowd is another task for researchers which needs an effective social media campaign of the crowdfunding process (Wheat et al., 2013; Aleksina et al., 2019). While other crowdfunding

campaigns than science projects in platforms like kickstarter.com have different success factors such as project quality (Mollick, 2014), scientific crowdfunding projects have parameters such as level of funding target and academic experience of the researcher (Sauermann et al., 2019).

Furtherly we had defined social influence as the combination of subjective norm and image. Subjective norm is the degree to which the scientist perceives that people who are important to her/him think he/she should or should not use the science crowdfunding. Regarding ethical concerns and risk associated with science crowdfunding, the academic community might be expected to approach it with suspicion. Image is the degree to which the scientist perceives that using science crowdfunding will leverage his status in the academic community. Raising research funds without a peer review mechanism might be considered as scientific inferiority by the scientist which he/she would not be interested in using crowdfunding. On the other hand, it might trigger an entrepreneurial image to be exposed to the community for crowdfunding. The results imply that the more an academics perceives that his/her peers are approaching crowdfunding positively, the more he/she possess behavioural intention. The results are consistent with the general technology acceptance models that the social influence positively effects the intention to use the technology. Regarding the interaction effects, when the academics possess more innovativeness, risk-taking and proactiveness thus individual entrepreneurial orientation exists, the effect of social influence on the behavioural intention is much stronger. The overall structural model suggests that in a limited research funding environment, when academics are exposed to science crowdfunding options in a positive and systematic manner, they might be open for starting crowdfunding research projects in this medium because of the social influence. If the academics possess an entrepreneurial profile, they will engage more in the science crowdfunding efforts, which may be effective in the project funding success.

7. Conclusion and further research

The paper contributed to the theory by testing the constructs of technology acceptance model in the context of science crowdfunding with the moderating effect of individual entrepreneurial orientation. Although entrepreneurial orientation has been used to explain technology acceptance behaviour and technology acceptance model has been used to understand crowdfunding behaviour in prior studies, this study is the first initiative to measure how individual

entrepreneurial orientation of academics will shape their technology acceptance behaviour in science crowdfunding. The paper's goal has been to develop prior technology acceptance models to claim the effect of individual entrepreneurial orientation on the relationship between technology acceptance determinants and intention to use.

Daldrup et al. (2020) claimed *"the crowdfunding literature rarely covers the untapped potential and challenges associated with crowdfunding for scientific institutions"*. As a practical implication, it is critical for entrepreneurial academics to access alternative funds to eliminate financial constraints for their innovative and entrepreneurial endeavours. It is assumed that digital innovations will boost academic entrepreneurship activities such as in the case of science crowdfunding for raising funds for scientific and entrepreneurial projects. Thus, it is a timely initiative to study technology acceptance of science crowdfunding to facilitate further research at the nexus of digitalization and academic entrepreneurship.

Entrepreneurship orientation is an important indicator of the ability of an organization (or of the individual with individual entrepreneurial orientation) to take steps to ensure a permanent competitive advantage for the future, to be prepared for future conditions and to implement strategies that will further improve the market position (García-Villaverde et al., 2018). On the other hand, a high level of technology adaptation allows researchers with limited resources to gain a significant opportunity advantage. Due to high uncertainties in the early stages of crowdfunding technology - in terms of ethics, trust and peer-review, the lack of legal infrastructure and the differences that may arise in the communication process, it is assumed that individual entrepreneurial orientation will facilitate the pace of technology adoption for science crowdfunding. As long as the university management takes the necessary steps to manage the risks associated with science crowdfunding (O'Donnell, 2020), the alternative funding setting will encourage entrepreneurial academics to engage in crowdfunding projects.

The main limitations of the research study include the size and the composition of the sample. Future research might reach out to a more inclusive and larger sample from especially technical and basic sciences which host sophisticated scientific research projects. Considering the presented results, future research might also investigate those hypotheses in different country contexts and add suitable variables for better explanation of the technology acceptance model.

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