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THE EFFECT OF ORGANIZATIONAL CLIMATE ON PROJECT SUCCESS AND PROJECT SPEED IN R&D TEAMS

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ABSTRACT

The aim of this research is to examine the effects of organizational structure and moderate environment, which are the dimensions of organizational climate in R&D teams, on project success and project speed. Structural equation modelling method was chosen because it is a very useful method to analyze highly complex multiple variable models and to reveal direct and indirect relationships between variables. Quantitative data was collected in a five-point Likert scale. Confirmatory factor analysis was performed to determine the convergent validity. Composite reliability and AVE values were calculated to determine reliability and discriminant validity of the scales respectively. The hypotheses were tested by using structural equation modelling method in AMOS statistics program. As a result of the analyses performed in this study, it has been empirically supported that moderate environment has a direct effect on project success and project speed in R&D teams. These results are in accordance with the extant literature. But, contrary to existing literature, the direct effect of organizational structure on project success and project speed has not been supported according to the result of this study.

Keywords: Organization Structure, Esprit of Profession, Moderate Environment, Project Success, Project Speed

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Introduction

In today's competitive environment, businesses have to innovate in order to survive and compete. Innovation strategies in businesses focus on issues such as technology management and technology development. In the light of these strategies, businesses sometimes produce, sometimes develop, and sometimes transfer technology (Miler, 1986; D'Aveni, 1994; Grant, 1996; Kazanjian et al., 2002). However, with the continuous development of technology, the change in product life curves in a short time, the rate of change of market elements and the increase in competition day by day have pushed businesses to develop new and sustainable strategies in this field (Brown and Eisenhardt, 1995; Spender, 1996; Kuwada, 1998). Businesses obtain the scientific knowledge that will form the basis of these strategies from R&D studies (Badri et al., 1997; Karlsson et al., 2004). Although R&D is used as a word, consisting of the combination of two words and having a single meaning, it actually explains concepts that have very different meanings from each other. R of R&D refers to basic scientific research and is very different from Development in terms of its purpose, way of working, team members and outputs. D of R&D represents applied development and differs from Research in terms of its aims and outputs. While the output of R is scientific knowledge, the output of D is new products, processes and methods (Quelin, 2000; Lu and Yang, 2003; Kratzer et al., 2004). Businesses have to understand the internal dynamics of R&D teams with different goals and outputs and manage the teams correctly. Research and practice show that R&D organizations need innovative organizational climates where change is a constant necessity. The structures of these organizations need to be flexible, but also able to adapt their processes and structures to the evolving context. Being prepared for change allows them to take advantage of the opportunities that change brings. The speed and effectiveness of project-based organizations in capturing change is critical to project success (Abrantes and Figueiredo, 2013). There are studies in the literature explaining that there are many factors that affect the outputs of R&D (Kim, 1997; Kuwada, 1998; Kotnour, 2000; Koh; 2000; Kratzer et al., 2004; Karlsson et al., 2004). Organizational climate is among the factors that affect the outputs of R&D teams. In the literature, there are few studies investigating the effects of organizational climate and its sub-dimensions on the outputs of R&D projects (Lang, 2001; Hauschild et al., 2001; Tutar and Altunöz, 2010; Azize and Arabacı, 2017). However, there is no study in the literature that explains the effects of organizational structure and moderate environment, which are sub-dimensions of organizational climate, on project success and project speed. This study investigates the effects of organizational structure and moderate environment factors, which are the dimensions of organizational climate, on project success and project speed. Consequently, this study aims to close this gap in the extant literature.

Theoretical Background

R&D Teams

R&D teams are among the most fragile teams within a company. R&D teams are the teams that are sometimes disliked and sometimes envied by other departments, but generally not understood. R&D teams include adhocracy structures. In other words, they easily adapt to changes and conditions. As Alvin Toffler (1970) said; "The faster the environment changes, the shorter the lifetime of organizational structures". For example, we see a transition from long-lasting structures to shorter-lasting structures in administrative structures such as architecture. In other words, there is a transition from bureaucracy to adhocracy. An adhocracy structure has a feature that is not rigid, but easily adaptable. It is characterized by task groups and ad hoc organizations, thereby increasing the organization's possibility of inventing and innovation. Because it causes the reduction of organizational secrets and rules that weakens the organizational culture and prevents the change of the organization. In short, organizations that do not renew themselves and stick to their traditions spend their energies on bureaucracy, while adhocracy structures use their energies to create original ideas. This does not mean that adhocracy organizations are not affiliated with a structure. Organizational structures allow employees to be in a structure that will remove the obstacles to the work. (Miller, 1986).

It is seen that groups acting in cooperation have realized successful innovations. R&D teams design develop and market while creating new products. R&D Teams are collective working groups that benefit from the individual experiences within the team and implement the application as soon as possible (Badri et al., 1997; Karlsson et al., 2004). A number of studies in the literature indicate that one of the most important factors that ensure the success of R&D teams is that the intelligence created by the team as a whole is above the individual intelligence (Hitt and Ireland, 2000; Calantone et al., 2002; Carayannis, 2002; Akgün and Keskin, 2003; Bstieler and Gross 2003; Akgün et al., 2006). In addition, the fact that the collective knowledge created is used to achieve the team's common goals is also a factor. In order to understand this success in R&D teams, it is necessary to explain and understand the real-life procedures and processes of the information

here. A serious understanding of the learning process and its effects on project outcomes is a requirement of learning in R&D teams. A better understanding of this learning would be to understand the cross-working of different research methods in the same field. Thus, a rich infrastructure is presented that allows defining and understanding the mechanism and key factors of learning as a group. R&D teams are a teamwork that creates the employees in the organization and their interactions, knowledge and organizational culture.

Organizational Climate

The concept of organizational climate has been the subject of many studies in the literature. The word climate, of Greek origin, means tendency. The word climate is not only used to describe physical events, but also a psychological expression that describes how people in the organization define the internal environment over time (Gilmer, 1971). The first important studies on Organizational Climate in the literature were made by Lewin, Lippit and White (1939). The most comprehensive definition in the literature was made by Argyris (1958), with his research describing the organizational dynamics in the bank. In this research, organizational climate is defined as the needs and personality of its employees and it is stated as a conceptual link that offers a solution to communication between individual and organizational relations (Payne and Mansfield, 1973, s. 5). In another study, organizational climate was associated with concepts such as culture, environment and emotion, and it was stated that such concepts reflect organizational quality and individual life (Tagiuri and Litwin, 1968). In another study, organizational climate is defined as measurable characteristics that can directly or indirectly affect the behavior and motivation of people living or working in a work environment. (Litwin adn Stringer, 1968). Organizational climate is also defined as the average of perceptions that people have in their daily working environment (Forehand and Gilmer, 1972). As a result of all these researches, organizational climate can be defined as a psychological term in which the intangible or tangible variables in the organization affect the behaviour of the employees in the organization. All climates that occur with the perception of individuals are a subject of psychology. Climate is an intangible concept. It is a concept that cannot be defined but can be felt. The attitudes, thoughts, feelings and behaviours of the members of the organization shed light on the general opinion about the organization and the profile of the organization. It is because they are intangible and perceptual that, like other psychological concepts, they can encompass the subject of similar principles of perception (Batlis, 1980).

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Dimensions of Organizational Climate

In the literature, it is seen that researchers divide the organizational climate into sub-dimensions and examine it in this way. The most well-known of these is the study of Litwin and Stringer (1968) in which they investigated the dimensions of organizational climate. In the study of Litwin and Stringer (1968), organizational climate is divided into 6 sub-dimensions. These are organization structure, responsibility, reward, risk, moderate environment (sincerity) and support. Organizational climate dimensions developed by Litwin and Stringer (1968) were later used and accepted in many studies and became an evaluation tool. In this study, the concept of organizational climate is examined in terms of Organization Structure and moderate environment dimensions.

Organizational Structure

Organizational structure is how employees feel about the degree of formality and freedom and constraints of behavior in the work environment (Litwin and Stringer, 1968). Organizational structure enables employees to be well organized and feel good in the organization (Fetrati et al., 2022). It also clearly defines the roles and responsibilities of employees. When the structure of an organization is lacking, there is a debate about who the competent decision maker is and who will do what (Jakobsen et al., 2019). It has a great effect on increasing the motivation and performance of employees. The organizational structure dimension is related to the instructions, perceptions and rules of the employees in the organization about the organizational structure (Fetrati et al., 2022). It is a concept that shows certain departments within the organizational structure and the dialogues within these departments, and each structure is formed after a certain period of time (Ghosh, 2021). Organizational structures have a significant impact on organizational climate (Walheiser et al., 2021). While an organizational climate is formed that negatively affects improvement and creativity in organizations with a high and rigid hierarchical order, the distribution of authority to more than one level in horizontal organizational structures increases improvement and creativity (Jakobsen et al., 2019).

The sense of restriction felt by the personnel in the organization in the working environment, the number and quality of the rules are the elements that make up the organizational climate (Patel et al., 2021).

Job descriptions within the organization, decision-making processes, organizational structure within the company, communication between managers and employees, and similar internal events all reveal the structure of the organization (Liu et al., 2018). Today, it can be said that flexible enterprises are more efficient than rigid enterprises.

Moderate Environment

Whether there is a friendly atmosphere among employees in an organization or whether there is a peaceful working environment are important indicators of a moderate environment Datta and Singh (2018). The relationship between the employees in an organization or the size of the relationship between the management and the employees are among the factors that explain the intimacy within the enterprise (Davidson et al., 2001). The feeling of being cared and loved by the group members of the group employees, and the friendship and camaraderie environment were examined in this dimension. A positive climate develops in organizations where bilateral dialogues are positive and sincere (Denison, 1996). Having warm and sincere relations improves the organizational climate and increases the motivation of the employees (Zhang and Liu, 2010). Businesses with a hierarchical structure have less sense of sincerity than other businesses. There is a positive atmosphere in businesses with a high sense of sincerity among employees. This has a positive effect on the performance of individuals (Volerya and Tarabashkina, 2021). On the other hand, in organizations with a high hierarchical order, the organizational climate and sincere relations will be damaged, and it will have a negative effect on employee motivation (Saks, 2021).

Project Success

Traditionally, 3 important dimensions are evaluated when determining project success. These are performance, schedule and cost (Koops et al., 2016). The neglect of the human factor in projects is a factor that causes project failure, although it has strategic importance (Yang et al., 2012). Likewise, the role of organizational climate in achieving project results is critical (Anantatmula, 2010; Geoghegan and Dulewicz, 2008; Jiang, 2014; Müller and Turner, 2007). Differences in project type, size, scope and context create many complex and stressful situations, and in such cases, the organizational structure and working environment must be appropriate for decision making (Byrne and Barling, 2015). Members of project teams involved in software/application/web development are faced with frequent changes in customer requirements (Schwaber and Beedle, 2002). Such teams are small but interdependent and share project responsibility. They also require extensive knowledge sharing because a single person may not have all the skills needed to complete a task. Likewise, cohesion, or how close team members are to one another and how much they value their bond with one another, is essential to project success (Cook et al., 2013). Most software/application/web development related tasks require a higher level of creativity (Pearce and Sims Jr, 2002). ScottYoung et al. (2019) pay attention to the importance of shared leadership, especially in their study in which IT teams investigated the factors contributing to project success.

Project Speed

R&D projects are an important factor in the competition between innovative companies. In R&D projects, time can be managed in terms of delay and speed (Mahmoud-Jouini et al., 2004). Faced with constantly changing competitive conditions, R&D teams must not only make the right decisions, but also make the decisions on time (Wen et al., 2018). Decision management is an integral part of project management, and project-based organizations have decision problems in almost all management hierarchies (Beringer et al., 2013). As firms increasingly organize their work around projects, the effectiveness and timeliness of project decisions has a profound impact on the performance of organizations (Eweje et al., 2012; Wen and Qiang, 2016b). The increasing complexity of project management causes delays in project decisions (Assaf and Al-Hejji, 2006). These delays harm the output of the project. Indeed, Wen et al. (2018) revealed that there is a relationship between project speed and firm performance in project management (Wen et al., 2018).

Project analysis shows that a firm can manage project speed by choosing a planned speed profile during the project preparation phase and maintaining an effective profile speed that may differ from the planned one (Mahmoud-Jouini, et al. 2004). The planned speed profile is chosen based on the firm's strategy for speed management. The effective profile is guided by the terms of the contract, the relationship between the customer and the contractor, and/or the importance of the delivery time for them (Akgün and Lynn, 2002; Wagner, 2010).

Hypothesis Development

Organizational Structure and Project Success

The IT industry is highly knowledge-intensive and therefore expertise and knowledge sharing are critical in meeting customer needs. The level of trust in the team positively softens the relationship between knowledge sharing and project success because trusted members act as facilitators for each other and increase knowledge sharing (Gerbasi et al., 2015). Recent research shows that a higher level of trust in a team increases the degree of collaboration, reduces uncertainty, and ultimately increases project success (Stephens and Carmeli, 2016; Bond-Barnar et al., 2018). In the light of above studies following hypothesis is developed.

H_1: Organization Structure has a positive effect on Project Success

Organizational Structure and Project Speed

Denicol et al. (2021) investigated the formation and evolution of organizational architecture in mega projects and revealed that organizational structure affects project success and speed (Denicol et al., 2021). In another study, Milicka et al. (2021), investigate the role of the project leader in a functional organizational structure, revealed that the organizational structure is effective on the success and speed of the project (Milicka et al., 2021). Hetemi et al. (2020) investigated how two project organizations experienced industrial changes and revealed that the organizational structure had an effect on the legitimacy of the project. This can be interpreted as affecting the success and speed of the project (Hetemi et al., 2020). In another study, Esposito et al. (2021) investigated the organizational structure created by mega project managers to achieve success and stated that the organizational structure affects the success and speed of the project (Esposito et al., 2021). In the light of above studies following hypothesis is developed.

H_2: Organization Structure has a positive effect on Project Speed

Moderate Environment and Project Success

Imam and Zaheer (2021) revealed in their study that trust and strong commitment within the project team have a significant and positive effect on project success (Imam and Zaheer, 2021). There are also studies in the literature that show that project members increase their bond with each other, team motivation and commitment to completing project tasks efficiently (Amabile, et al., 2004). Andres and Zmud (2002) revealed that the positive climate within the team affects the success of the project (Andres and Zmud, 2002). In the light of above studies following hypothesis is developed.

H_3: Moderate environment has a positive effect on Project Success

Moderate Environment and Project Speed

Research and practice show that R&D organizations need innovative organizational climates where change is a constant necessity. The structures of these organizations need to be flexible, but also able to adapt their processes and structures to the evolving context. Being prepared for change allows them to take advantage of the opportunities that change brings. The speed and effectiveness of project-based organizations in capturing change is critical to project success. There are studies in the literature showing that there is a relationship between moderate environment and project speed. Like project success, project speed is also related moderate environment (Abrantes and Figueiredo, 2013; Hetemi et al., 2020; Denicol et al., 2021; Esposito et al., 2021). In the light of above studies following hypothesis is developed.

H_4: Moderate environment has a positive effect on Project Speed

In this study, the relationship among organizational structure, moderate environment project success and project speed has been tried to clarify. In line with the theoretical background of these concepts theoretical model formed as seen in Figure 1.

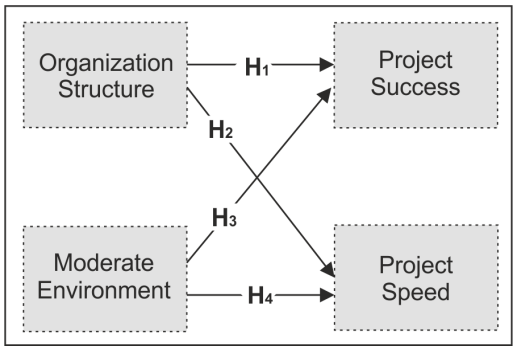


Figure 1. Theoretical Model

Research Methods

The scales have been adopted from literature. Quantitative data has been provided by means of questionnaire designed in a five-point Likert scale. Structural equation modelling method was chosen because it is a very useful method to analyze highly complex multiple variable models and to reveal direct and indirect relationships between variables. Initially, confirmatory factor analyses were performed to determine the convergent validity. Composite reliability and AVE values were calculated to determine reliability and discriminant validity of the scales respectively. The hypotheses were tested by using structural equation modelling method in AMOS statistics program. Structural Equation modelling as a multi variable statistical technique has been used to test the hypotheses of the theoretical model (Meydan and Şen, 2011). This technique was used to understand the indirect and direct effects in the theoretical model (Civelek, 2018). This technique has been selected in order to decrease measurement errors (Byrne, 2010). The analyses were performed by means of SPSS and AMOS statistics programs.

Measures and Sampling

The constructs in the theoretical model of the research were measured by the scales taken from extant literature. The Likert scale in 5-point was used from a strong disagreement to strong acceptance. More than 400 were distributed and 202 valid questionnaires from R&D firms in Turkey were collected. The organizational climate scale developed by Stringer (2002) was used to measure the organizational structure and moderate environment variables, which are the sub-dimensions of organizational climate. In order to measure project performance, the scale suggested by Akgün et al. (2006) was used. To measure the project speed the scale developed by Kessler and Chakrabarti (1996) was used.

Construct Validity and Reliability

First, exploratory factor analysis (EFA) was applied to purify the data and make the data ready for confirmatory factor analysis (CFA) (Anderson and Gerbing, 1988). 20 items remained after principal component analysis. Then convergent validity was determined by applying CFA. Fit indices values of the CFA were found satisfactory (i.e., $\chi 2/DF = 4.894$, CFI=0.930, IFI=0.931, RMSEA= 0.084) (Civelek, 2018). Table 1 shows the factor loads in CFA Results. As shown in Table 2, average variance extracted values were near or above the limit point (i.e., 0.5) (Byrne, 2010). These results proved the convergent validity of the constructs. To determine discriminant validity, the square roots of AVE values of each variable were obtained. In Table 2, the diagonals indicate the square root of AVE values. All the square root of AVE values is greater than the correlation values in same column. This indicates that the discriminant validity is determined (Civelek, 2018). The reliability of each structure was calculated separately. Composite reliability and Cronbach α values are near or more than the limit point which is recommended as 0.7 (Fornell and Larcker, 1981).

Table 1. Confirmatory Factor Analysis Results

Variables	Items	Standardized Factor Loads	Unstandardized Factor Loads
Organization Structure (OS)	OS06	0.951	1
	OS07	0.815	0.815
	OS05	0.737	0.741

	OS02	0.829	0.801
Moderate Environment	ME03	0.953	1
	ME02	0.914	1.024
	ME04	0.964	1.114
Project Success (PS)	PS07	0.921	1
	PS01	0.946	1.130
	PS03	0.887	1.034
	PS08	0.845	1.033
	PS05	1.110	1.312
	PS04	0.839	0.975
	PS06	0.893	1.049
	PS02	0.870	1.064
	PS09	0.727	0.847
Project Speed (PP)	PP02	0.973	1
	PP01	0.940	0.935
	PP03	0.860	0.813
	PP04	0.718	0.690

$p<0.01$ for all items

Descriptive statistics of the dimensions, Cronbach α and composite reliabilities, average variance extracted values and Pearson correlations among the dimensions are indicated in Table 2.

Table 2. Construct Descriptives, Reliability and Correlation

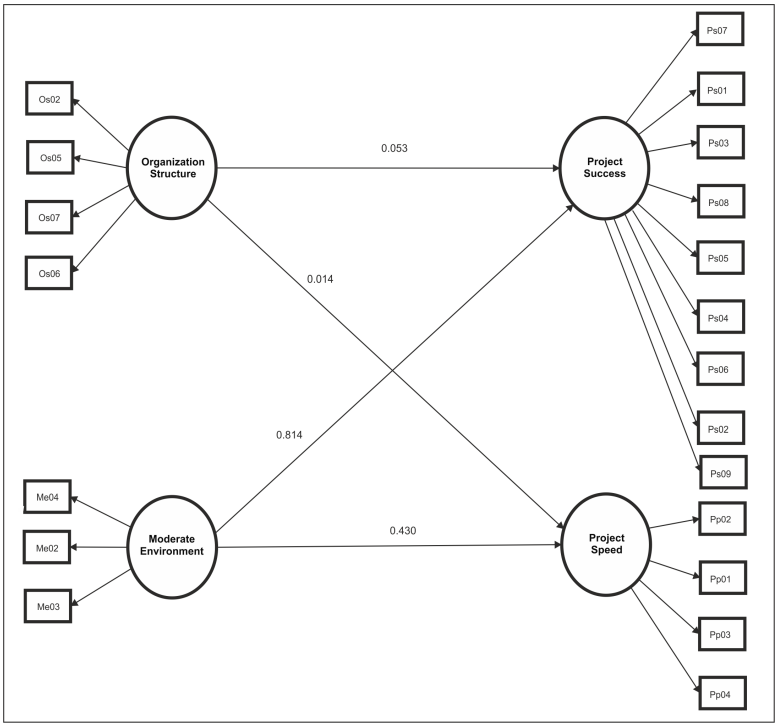
Variables	**1**	**2**	**3**	**4**
1. Organization Structure	(.837)			
2. Moderate Environment	.313*	(.944)		
3. Project Success	.251*	.805*	(.898)	
4. Project Speed	.117	.481*	.602*	(.880)
Composite reliability	.902	.961	.974	.931
Average variance ext.	.700	.891	.807	.775
Cronbach α	.898	.964	.966	.929

*$p < 0.05$

Note: Values in diagonals are the square root of AVEs

Test of the Hypotheses

For testing the hypotheses covariance-based structural equation modelling (CB-SEM) was used. CB-SEM is a confirmatory method (Civelek, 2018). Therefore, in this research, it is used to confirm the hypotheses which are developed by depending upon the base theories in literature. The fit of the structural model was evaluated according to the goodness of fit indices. Fit indices values of the structural model were found satisfactory (i.e., $\chi 2/DF = 4.003$, CFI = 0.958, IFI = 0.959, RMSEA= 0.079) (Civelek, 2018).



Note: $\chi 2/DF = 4.003$, CFI = 0.958, IFI = 0.959, RMSEA= 0.079

Figure 2. Results of the SEM Analysis

Table 3. Hypotheses Test Results

Relationships	Standardized Coefficients	Unstandardized Coefficients	Hypotheses	Results
OS → PS	0.053	0.034	H_1	Not Supported
OS → PP	0.014	0.014	H_2	Not Supported
ME → PS	0.814*	0.740	H_3	Supported
ME → PP	0.430*	0.586	H_4	Supported

*$p < 0.05$

H1 hypothesis is not supported. This means Organizational Structure (OS) does not have a direct effect on Project Success (PS). As seen in Table 2, although the correlation value between these two constructs is positive, the model resulted a negative value. This means OS does not have a direct effect on PS. H2 hypothesis is not supported. This means Organizational Structure (OS) does not have a direct effect on Project Speed (PP). H3 hypothesis is supported. This means that moderate environment has a direct effect on Project Success (PS). H4 hypothesis is supported. This indicates that moderate environment has a direct effect on Project Speed (PP).

Discussion

This study investigated the effect of organizational climate on project success and project speed in R&D teams. The existing studies in the literature confirm that moderate environment effect project success because, if a climate of trust and commitment is created within the team, this will affect the project performance of the team (Imam and Zaheer, 2021). The results of this study confirmed the theoretical argument of the studies in the literature (Abrantes and Figueiredo, 2013; Hetemi et al., 2020; Denicol et al., 2021; Esposito et al., 2021) and indicate that moderate environment has a direct effect on project speed. Because R&D organizations need innovative organizational climates where change is a constant necessity. The moderate environment of these organizations needs to be mild. Being prepared for change allows them to take advantage of the opportunities that change brings. The speed and effectiveness of project-based

organizations in capturing change is critical to project success. This is due to the fact that organizational structure has a direct effect on project success and project speed (Denicol et al., 2021; Milicka et al., 2021). According to the result of this study, organizational structure does not effect on project success and speed. This explains that especially with the covid-19 pandemic, the spread of remote and flexible working form in businesses does not allow employees to work in an organization. This can have an effect that disrupts organizational structures among project-based teams.

Implications

With the help of theoretical discussion and empirical support, this study suggests that moderate environment in R&D teams contributes to project success and project speed. Team leaders should understand the growing role of organizational climate on project outputs. Team leaders should understand that agile project teams cope with unexpected challenges and get rid of unprecedented threats in the business environment (Abrantes and Figueiredo, 2013; Hetemi et al., 2020; Denicol et al., 2021; Esposito et al., 2021). Team leaders should encourage team members to be more creative and innovative and create a working environment where team members' creativity will increase.

Conclusion

Creativity and innovative thinking are very important factors in R&D teams. Since the comfort, trust and commitment of the team members in the R&D teams directly affect the outputs of the R&D projects, it can be said that these teams need a moderate working environment. Otherwise, in cases where the project members feel insecure and do not feel dependent, the project outputs may be adversely affected. Contrary to the literature, the organizational structures of R&D teams do not have a direct effect on project outputs, which will be the subject of future research.

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Ulakbilge
Sosyal Bilimler Dergisi

THE EFFECT OF ORGANIZATIONAL CLIMATE ON PROJECT SUCCESS AND PROJECT SPEED IN R&D TEAMS

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ÖZ

Bu araştırmanın amacı, Ar-Ge ekiplerinde organizasyonel iklimin boyutları olan organizasyon yapısı ve ılımlı çevrenin proje başarısı ve proje hızı üzerindeki etkilerini incelemektir. Yapısal eşitlik modelleme yöntemi, oldukça karmaşık çok değişkenli modelleri analiz etmek ve değişkenler arasındaki doğrudan ve dolaylı ilişkileri ortaya çıkarmak için çok kullanışlı bir yöntem olduğu için seçilmiştir. Nicel veriler beşli Likert ölçeğinde toplanmıştır. Yakınsak geçerliliği belirlemek için doğrulayıcı faktör analizi yapılmıştır. Ölçeklerin güvenilirliğini ve ayırt edici geçerliliğini belirlemek için bileşik güvenilirlik ve AVE değerleri hesaplanmıştır. Hipotezler AMOS istatistik programında yapısal eşitlik modelleme yöntemi kullanılarak test edilmiştir. Bu çalışmada yapılan analizler sonucunda Ar-Ge ekiplerinde ılımlı ortamın proje başarısına ve proje hızına doğrudan etkisi olduğu ampirik olarak desteklenmiştir. Bu sonuçlar mevcut literatür ile uyumludur. Ancak mevcut literatürün aksine organizasyon yapısının proje başarısına ve proje hızına doğrudan etkisi bu çalışmanın sonucuna göre desteklenmemiştir.

Anahtar Kelimeler: Organizasyon Yapısı, Meslek Ruhu, Ilımlı İş Ortamı, Proje Başarısı, Proje Hızı