






## A STUDY OF SMARTPHONE COMPANIES: DO INNOVATION CULTURE AND RADICAL INNOVATION AFFECT INSTITUTIONALIZATION AND SUSTAINABLE COMPETITION POSITIVELY?

*UM ESTUDO SOBRE EMPRESAS DE SMARTPHONES: A CULTURA DA INOVAÇÃO E A INOVAÇÃO RADICAL AFETAM POSITIVAMENTE A INSTITUCIONALIZAÇÃO E A COMPETIÇÃO SUSTENTÁVEL?*

*UN ESTUDIO DE EMPRESAS DE TELÉFONOS INTELIGENTES: ¿LA CULTURA DE INNOVACIÓN Y LA INNOVACIÓN RADICAL AFECTAN POSITIVAMENTE LA INSTITUCIONALIZACIÓN Y LA COMPETENCIA SOSTENIBLE?*

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### Abstract

**Objective of the study:** The present study examines how innovation culture and radical innovation elicit sustainable competition. The study proposes institutionalization as an important underlying mechanism that originates from innovation culture and radical innovation and provides the basis for sustainable competition.

**Design/methodology/approach:** The data were collected from 763 employees working in smartphone companies located in Istanbul, Turkey. The analysis was performed employing PROCESS macro in order to test the hypothesized relationships.

**Findings:** Results show that both innovation culture and radical innovation have a positive impact on institutionalization and sustainable competition. Moreover, the data also support the mediation effect of institutionalization in predicting sustainable competition.

**Practical implications:** The findings imply that the structure of the firms must be ready for change in order to reap the benefits of sustainable competition. In fact, the creation of an innovation culture is very important in technology-intensive firms because there is a need to create common values that encourage employees to adopt innovative behaviors for sustainable competition. Furthermore, radical innovation can be more advantageous for firm-outcomes when large structural differences are identified and bridged successfully.

**Originality/value:** The study develops a novel framework of innovation-competition using a structural perspective, empirically testing the proposed relationships using data from the technology-intensive industry of Turkey.

**Keywords:** Innovation culture. Radical innovation. Institutionalization. Sustainable competition

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## Resumo

**Objetivo:** O presente estudo examina como a cultura de inovação e a inovação radical geram competição sustentável. O estudo propõe a institucionalização como importante mecanismo subjacente, que se origina tanto da cultura da inovação quanto da inovação radical, e fornece a base para uma competição sustentável.

**Projeto/metodologia/abordagem:** Os dados foram coletados de 763 funcionários que trabalham em empresas de telefonia móvel, localizadas em Istambul, Turquia. A análise foi realizada utilizando a macro PROCESS para testar os relacionamentos hipotetizados.

**Resultados:** Os resultados mostram que tanto a cultura da inovação quanto a inovação radical têm impacto positivo na institucionalização e na competição sustentável. Além disso, os dados também apoiaram o efeito de mediação da institucionalização na previsão da competição sustentável.

**Implicações práticas:** As descobertas implicam que a estrutura das empresas deve estar pronta para mudanças para colher os benefícios da competição sustentável por meio da inovação radical e da cultura de inovação. A criação de uma cultura de inovação é muito importante em empresas intensivas em tecnologia, pois é necessário criar valores comuns para incentivar os funcionários a comportamentos inovadores para competições sustentáveis. A inovação radical pode ser mais vantajosa para os resultados da empresa quando grandes diferenças estruturais são identificadas e superadas com sucesso.

**Originalidade/valor:** O estudo desenvolve uma nova estrutura de inovação-competição usando perspectiva estrutural e testa empiricamente as relações propostas usando dados da indústria intensiva em tecnologia da Turquia.

**Palavras-chave:** Cultura de inovação. Inovação radical. Institucionalização. Competição sustentável.

## Resumen

**Objetivo:** El presente estudio examina cómo la cultura de la innovación y la innovación radical provocan una competencia sostenible. El estudio propone la institucionalización como un mecanismo subyacente importante, que se origina tanto en la cultura de la innovación como en la innovación radical, y proporciona la base para una competencia sostenible.

**Diseño/metodología/enfoque:** Los datos se recopilaron de 763 empleados que trabajan en empresas de telefonía móvil, ubicadas en Estambul, Turquía. El análisis se realizó empleando la macro PROCESO para probar las relaciones hipotetizadas.

**Hallazgos:** Los resultados muestran que tanto la cultura de la innovación como la innovación radical tienen un impacto positivo en la institucionalización y la competencia sostenible. Además, los datos también respaldaron el efecto mediador de la institucionalización en la predicción de la competencia sostenible.

**Implicaciones prácticas:** Los resultados implican que la estructura de las empresas debe estar preparada para el cambio a fin de cosechar los beneficios de la competencia sostenible a través de la innovación radical y la cultura de la innovación. La creación de una cultura de innovación es muy importante en las empresas intensivas en tecnología porque existe la necesidad de crear valores comunes para alentar a los empleados hacia un comportamiento innovador para competencias sostenibles. La innovación radical puede ser más ventajosa para los resultados de la empresa cuando se identifican y superan con éxito grandes diferencias estructurales.

**Originalidad/valor:** el estudio desarrolla un marco novedoso de innovación-competencia utilizando una perspectiva estructural y prueba empíricamente las relaciones propuestas utilizando datos de la industria intensiva en tecnología de Turquía.

**Palabras clave:** Cultura de innovación. Innovación radical. Institucionalización. Competencia sostenible.

## 1 Introduction

For most organizations, change is inevitable as a result of the incompatibility of organizational culture and structure (Kalyar et al., 2020). That is why organizational culture and structural issues are gaining significant importance in the debate regarding their strategic role in organizational change and the subsequent achievement of sustainable competitive advantage (Xie et al., 2019). Organizational changes often increase and intensify competitiveness because the organizational infrastructure demands significant changes in strategy, technology, operating systems, and management forms (Doh et al., 2019; Jansen et al., 2012). These changes require in-depth analysis of the values, beliefs, and behavioral patterns involved in organizational success (Xie et al., 2019).

The process of change should be considered as part of the organization (Denison, 2000). Additionally, organizations that are knowledge-based should know that success is related to multiple factors: creativity, innovation, and discovery (Read, 1996), creating brand new or improved products, services and organizational methods (marketing, distribution, procurement, etc.) to identify and meet customer needs (Tidd & Bessant, 2018). Clearly, organizations must live as a culture of innovation. At the same time, innovation fused with a competitive mindset should be the driving force of development. In other words, a brand new and improved product/service is the discovery of new production/service methods, as well as market, resource or organizational methods (Schumpeter & Backhaus, 2003). In this way, innovation should be institutionalized for an organization, thereby creating value (Drucker, 2002).

Indeed, in the process of change, creativity and innovation play a vital role: organizations embed innovation into culture, promoting innovation activities across all functional areas, while also implementing radical innovations. However, when organizational structures fail to opt for either radical innovation or innovation culture, organizations may experience a negative impact on sustainable competition.

In an energetic and fast-moving business environment, the characterization of business operations requires high innovation to generate profits, increase performance, and boost productivity (Hanifah et al., 2019). However, the speed and quality of innovation is more important in complex and ever-changing business environments (Wang et al., 2016) since innovation is a critical factor in determining organizational sustainability (Ghasemzadeh et al. 2019). In particular, the question arises as to whether radical innovation and innovation culture in technology-oriented companies positively affects both institutionalization and sustainable competition? This question constitutes the research model of the study.

The present study aims to examine the effects of innovation culture and radical innovation on organizational sustainable competition in smartphone companies. Further, the study also answers how institutionalization mediates the above stated relationships. Additionally, in choosing smartphone companies, searching for new investment areas in the realization of continuous change and innovation activities is necessary because innovation should be marketable for such companies in the smartphone

sector, and a new or improved production/service method should be transformed (Schilling & Shankar, 2019).

Within the scope of research, the importance of institutionalization and sustainability in smartphone companies experiencing constant change were examined and analyzed with the data obtained. The SPSS, LISREL, and the SPSS PROCESS V3 plug-in were incrementally used in the analyzes to gain insight into data and test model compatibility.

As a result of research, firms that have a culture of innovation within the organizational structure are successful in radical innovation, positively affecting both institutionalization and sustainable competition.

## 2 Literature review

### 2.1 Innovation culture

An innovative culture reflects how well a firm is suited to developing innovation, and a cultural trend towards innovation is proactive in exploring new opportunities. In order for organizations to adopt innovation as a culture, they need individuals with the same thought process. In order for an innovative culture to form, individuals need to constantly engage in new and creative activities and to be able to transfer this culture to new individuals (Ghasemzadeh et al., 2019).

Innovation culture in a company is a set of common values and beliefs aimed at exploring new opportunities, developing innovation, and facilitating the innovative behavior of employees (Sattayaraksa & Boon-itt, 2016). Improving or replacing existing business processes to increase efficiency and productivity enables a business to extend the quality of existing product, services, or operations. Hence, with the formation of innovation culture, the organizational structure can create an important infrastructure for institutionalization centered around distilling the ability to innovate independently from individuals. At the same time, together with innovative behaviors, significant support for sustainable competition can be provided. In order to understand the positive impacts of innovation culture, it is necessary to focus on the fundamental definition of innovation.

Damanpour (1991) defines innovation from a corporate perspective. This definition is the adoption of a new idea or behavior for the organization, regardless of whether it is a system, policy, program, device, process, product or service. Adelekan (2016) defines the innovation culture as the need for the maximum number of innovative ideas that can arise within a given period of time. These innovative ideas are important for the organization to achieve sustainable success in the competitive environment, giving organizational sustainability grounded continual improvements that fulfill the needs of growth.

According to Dobni (2008), the operational level behaviors needed to influence the infrastructure, market, and value orientation to support innovation, and the implementation of innovation, are defined within an innovation culture. From this definition, it can be explained that the

market and value to ensure sustainable competition are possible within the culture of innovation. Porter and Stern (1999) define innovation as transforming knowledge from a customer perspective into new products, processes, and services that include more than science and technology. This definition means that customers' requests and needs can be met and managed independently from individuals but rather within an institutionalized culture.

Innovation is not easy to implement without having an organizational culture that centers around innovation. For this reason, the culture of innovation needs to be strengthened in the daily business environment (Halim et al., 2015) and is a practice of thinking that continually challenges the existing one. In fact, companies with a culture of innovation are more resilient, have a greater capacity to quickly adapt and respond to changes in times of instability while identifying new opportunities (Kneipp et al., 2019). In addition, companies that implement high-level innovation can develop and sustain a competitive advantage (Ratnawati Soetjpto et al., 2018). So, innovation is an integral factor in the competitive capacity of the organization allowing organizational resources to be effectively used (Saji & Ellingstad, 2016). Within this scope, the effects of innovation culture on institutionalization and sustainable competition are examined.

## 2.2 Radical innovation

Schumpeter (1991), within the concept of “creative destruction, notes that innovation causes fundamental changes in the market and in those that are successful enough to remain in the market. According to Schumpeter (1991), innovation is essential for development, and increasing profits, all of which lead to the domination of the market. Therefore, successful innovation firms use this opportunity, often driving the market, and simultaneously, erasing competitors from the market. Innovation can provide the birth of new industries, which in turn means new business opportunities. Radical innovation realizes great transformations in the company's current capabilities and creates the basis for the emergence of completely new products and services (Ritala & Hurmelinna-Laukkanen, 2013). With a more comprehensive definition, radical innovation is the development of new ideas and technologies, or significant cost reductions, and the development of new business and product lines within the relevant sector (Leifer et al., 2000).

Radical innovation can offer a new set of performance features, as well as drastic improvements to existing and known performance characteristics. It can also promise significant reductions in costs, leading to changes in the market and technology (Bouncken & Kraus, 2013), and the possible development of new markets.

According to Gassman et al. (2010), original product manufacturers need new knowledge beyond traditional R&D studies for radical innovation. In order to remain a leader in a radically competitive environment, it is necessary to benefit from a wide portfolio of resources where risk factors

are well-calculated since radical innovations often bring uncertainty, often based on the implementation of new and emerging and completely unknown and untested technologies (Fynes et al., 2004).

Small and medium-sized companies have the advantage of being entrepreneurs in innovation because they can be more flexible, making quick decisions since they have the capability to quickly connect to their customer base (Dodgson, 2018). However, investments made by large companies in R&D are very difficult for small companies. Therefore, radical innovations often emerge from the R&D departments of large firms. In addition, firms tend to customize and diversify their products according to competitors in such a way that they attract new customers.

In radical innovation, knowledge needs to be used correctly without damaging institutionalization. If the information obtained is learned by competitors, the radical innovation feature can be eliminated, even to the extent that it can damage the institution (Bouncken & Kraus, 2013). However, in addition to sustainability-oriented start-ups, some corporate pioneer companies (Hockerts & Wüstenhagen, 2010) focus on integrating radical product innovation for sustainability at the core of their business strategies (Dangelico et al., 2013). In particular, it is stated that the strategic mechanisms affecting the choice of innovation paths for radical innovation remain unclear, but radical innovation practices are important for sustainability (Boons & Lüdeke-Freund, 2013). In this case, it is likely that institutionalism and sustainability are positively affected by radical innovation; therefore, if radical innovation is successful, a firm may be in an advantageous position against competitors. Within this scope, the effects of radical innovation on institutionalization and sustainable competition are examined.

### *2.3 Institutionalization*

Rapidly changing competitive conditions in the globalizing world require companies to adapt to change in order to survive (Bayer, 2005), minimizing their dependence on individuals and investing in a robust administrative system (Reay et al., 2016). Broom and Selznick (1955) define institutionalization as "the emergence of an orderly, stable, and socially integrated organizational structure" (Selznick, 1996). And, these necessary conditions have revealed the process of institutionalization, a process which refers not to a disorderly and irregular structure but rather to the continuity of its functioning, despite the change of individuals within the institution of a regular and balanced formation. Therefore, in order to avoid having an unstable and irregular organizational structure, it is necessary to create a culture independent of individuals.

In addition to a culture of independent of individuals, research and development in organizations must be active. When these are formed, institutionalization is defined as 'merging the system with the values of the organization' (İbicioğlu, 2005). With the provision of institutionalization, the management of the organization is independent of individual rules, procedures, and standards; in contrast, the culture of the organization's specific forms and methods of doing business are translated into the process of acquiring a distinctive identity (Ulukan, 2005). There are still institutions that have

continued for more than 100 years where institutionalization is not possible in a short time period, and the pace of cultural change proceeds very slowly, taking many years to gain a unique educational foothold (Ural & Balıkcıoğlu, 2004).

In summary, in order for companies to be institutionalized, it depends on the transition from an unstable structure to a stable and regular structure, internalizing the corporate culture by all employees and managers, perceiving it in the same way as everyone else, and applying it in every condition and environment (Apaydın, 2007). In this context, along with the effects of innovation culture and radical innovation on institutionalization, the mediation effect of institutionalization is also examined.

#### *2.4 Sustainable competition*

According to Porter (1985), the conceptual use of sustainable competitive superiority is profitable against the forces that determine the industry competition or “Competitive Advantage”: first-time competitive strategies are required to achieve a position and sustainable competitive advantage. Although Porter (1985) used this concept for the first time, he did not clearly define sustainable competitive superiority. In 1998, the first edition of Porter's “Competitive Advantage” was found to use the concept of “sustainable competitive superiority” instead of competitive superiority (Klein, 2002).

Porter (1998) stressed that three factors are necessary to achieve sustainable competitive superiority. The first is the source of this competitive superiority. The second is the amount of this resource, and the third and most important factor is continuous innovation and improvement. If there is continuous innovation, sustainable competitive advantage can be achieved. In other words, sustainable competitive superiority is based on the sustainability of competitive superiority over a long period of time (Porter, 1998).

In his study, Barney (1991) stated that, along with the resource-based theory, sustainable competitive advantage consists of valuable, rare, hard-to-imitate and unsubstantiated resources. It does not apply a strategy of creating a value that cannot be used by any other existing or potential competitor at the same time. In order to achieve sustainable competitive superiority, the following four criteria must be included (Hitt et al., 2016): Businesses must have valuable abilities; Businesses must have “rare” abilities; Businesses must have skills in which imitation is expensive; Businesses must have skills that are difficult to substitute. It is stated that having these criteria will create great potential for businesses to achieve a sustainable competitive advantage.

But, while the types of resources used by each company, their quantity and characteristics differ, the strategies applied by firms explain the heterogeneity of the resources and capabilities of firms. In fact, according to the resource-based theory, the constant (immobility) and heterogeneity (heterogeneity) expresses the inability to transfer company resources for focused sustainable competitive superiority (Barney, 1991).

Ensuring sustainable competitive superiority is said to be related to using and developing skills using resources within the company, and the literature of competitive superiority emphasizes that it should be considered within the framework of valuable, rare, inimitable, and non-substitutable dimensions. In order for companies to continue this advantage, sustainable strategies based on resources and capabilities, good investment, original patents, protection of commercial privacy, and differing companies in the sector emphasize the importance of cooperation.

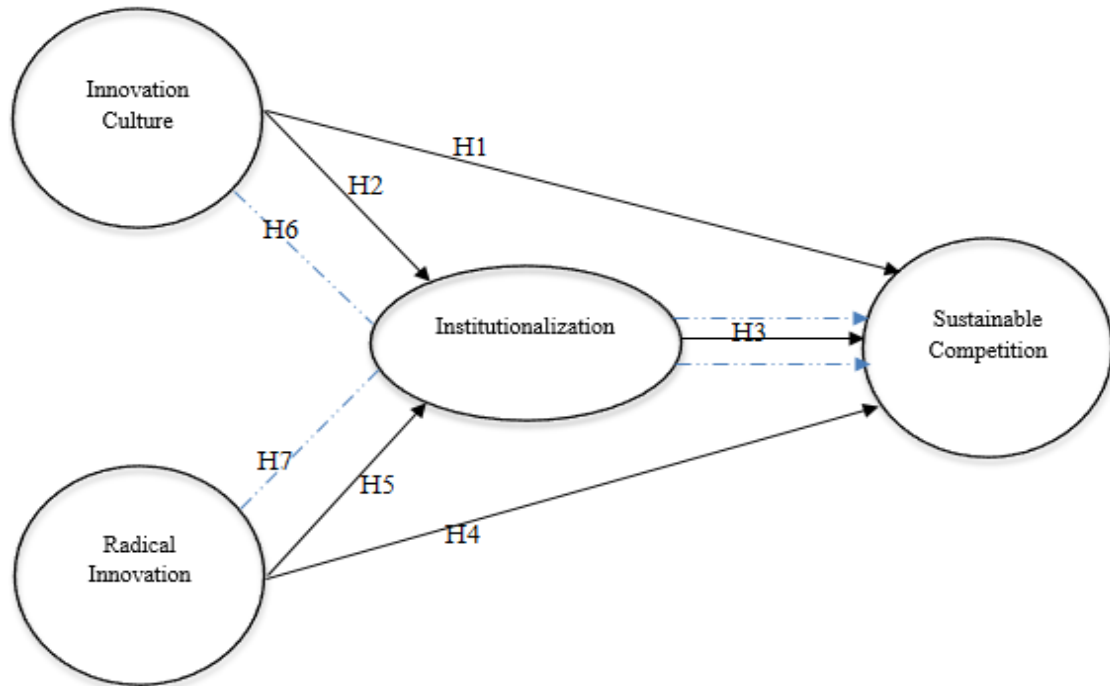
### *2.5 Examining the relationships between variables*

In looking at the research, Kuncoro and Suriani (2018) studies indicate that innovation practices have a positive impact on sustainable competitive advantage. Additionally, Hidalgo and Albers (2008) stated in their work that companies should create a culture of innovationa positive effect on the sustainability of the firm. Horng et al. (2017) state that sustainable innovation activity can be realized thanks to the innovation diffusion carried out in Taiwan hotels. This research shows that innovation activities are inevitable in the service sector as well as in the production sector. At the same time, Baaij et al. (2004) as a result of their research, stated that innovations are important for sustainable competitive superiority since sustainable competitive superiority positively affects the company's performance. Yu et al. (2017) stated that process innovation capability and product innovation capability positively affect sustainable competitive advantage in their research on 315 Chinese industrial companies. Furthermore, Evans et al. (2017) emphasize the importance of business model innovation in order to ensure sustainability in their research. And, Zhang et al. (2019) explained in their research that technological innovation positively affects organizational performance and organization sustainability, and sustainability positively affects organization performance both as an independent variable and as a mediation variable. Moreover, Eidizadeh et al. (2017) stated in their research that organizational innovation positively affects competitive advantage. In some studies, it is stated that organizational innovations will create sustainable competition. In this case, it can be predicted that the innovation culture and radical innovations realized within the organization can positively affect sustainable competition (Soltani & Hosseini, 2012; Wong, 2013). And, the research model created as a result of the explanations and literature review is presented in Figure 1. Hypotheses H1-H5 showing direct effects, H6 and H7 showing indirect effects.



**Figure 1**

*Research model*



**Source:** Authors’s database.

Based on this research, hypotheses examined and tested are as follows:

H1: In high-tech smartphone companies, innovation culture has a positive effect on sustainable competition.

H2: In high-tech smartphone companies, innovation culture has a positive effect on institutionalization.

H3: In high-tech smartphone companies, institutionalization has a positive effect on sustainable competition.

H4: In high-tech smartphone companies, radical innovation has a positive effect on sustainable competition.

H5: In high-tech smartphone companies, radical innovation has a positive effect on institutionalization.

H6: In high-tech smartphone companies, institutionalization mediation has a relationship between innovation culture and sustainable competition.

H7: In high-tech smartphone companies, institutionalization mediation has a relationship between radical innovation and sustainable competition.

### 3 Methodology

Due to the fact that it is costly and time consuming to reach the entire population, a basic sampling method was used to obtain data. The province of Istanbul, where many smartphone companies are headquartered, was selected for research and white-collar employees working in smartphone companies were asked to answer the survey by using the survey link sent to them (on a voluntary basis). A pretest with 100 participants was conducted because the intelligibility of questionnaire questions is thought to improve reliability and reliability. 81 returns from 100 participants and the first pretest was made on the structure. Innovation Culture 15, Radical Innovation 4, Institutionalization 15 and Sustainable Competition 9 are presented on the first scale. When the general structure of the form was reviewed for all statements, statements that affected validity and reliability were eliminated from the scale: The statements that did not show the appropriate factor loading in the pre-test phase and negatively affected the discriminant and content validity were excluded from the analysis, one by one. The scale was finalized when appropriate reliability and validity results were obtained. However, in the pretest 4 at Innovation Culture, 5 in Institutionalization and 3 statements in Sustainable Competition did not show the required factor burden and were removed from scale as well. The newly created scale includes Innovation Culture 11, Radical Innovation 4, Institutionalization 10, and Sustainable Competition 6 items. The survey link was sent by mail to 1024 employees from which 763 of them were returned. When examining the data sets obtained, no measurements were found, and the operations were carried out with data from 763 participants- the primary data source.

Resources used in representing variables included Innovation culture scale; Padilha and Gomes (2016) study. Padilha and Gomes (2016) adapted the scale used in study from Martins and Terblanche (2003); Nkosi and Roodt (2004); Zdunczyk and Blenkinsopp (2007). The radical innovation scale is taken from the study of Zhou and Li (2012). The scale of institutionalization was taken from the work of Tavşancı (2009). The scale of Sustainable Competition was taken from Li (2016)'s work.

The most important action to avoid common method variance was anonymity provided to the survey. Links sent to email accounts provided access to an online survey platform and there was no request for information regarding the identity of the responder. There were no restrictions on the questionnaire response time, and it was actively held for 30 days after the day the survey was uploaded.

The SPSS, LISREL and SPSS PROCES V3 plug-in were gradually used to obtain information about data and test model compatibility. In the first part of the survey, demographic questions, the second part is a four-dimensional structure consisting of scale expressions for IC, RI, I and SC. The measurement of all these dimensions was scored with the Likert Scale of 5 ranging from “Absolutely Disagree” to “Strongly Agree”. In the analysis, first information was given about the general structure of the data, the degrees of the relationship between the variables were determined, then analyzes related to model harmony were made. Analyses related to the direction of the relationship between variables and the effect of mediation variable are included in the last part.

The study examines the accuracy of the model given in Figure 1 between Innovation Culture (IC), Radical Innovation (RI), Institutionalization (I) and Sustainable Competition (SC). The resulting model based on literature was analyzed with scales created. Direct effect of IC variable on SC (H1) and I (H2), direct effect of RI variable on I (H5) and SC (H4), direct effect of I on SC (H3) and SC (H3) with RI (H7), the mediator effect on the relationship between IC and SC (H6) was analyzed.

#### 4 Analyses

The application parts of the study were started with Factor analysis. Factor analysis assumes that the observed variables are linear combinations of some underlying (hypothetical or unobserved) factors (Kim & Mueller, 1978). Factor analysis collects related data under the same set or factor by looking at correlation relationships between data (Sönmez Çakır, 2019). Before performing factor analysis, the Kaiser-Meyer Olkin (KMO) sample conformity test to determine whether the data is suitable for factor analysis and to obtain valid and reliable results, and Bartlett's globality test results was looked at. Table 1 shows the results of the globality test of Kaiser-Meyer-Olkin Bartlett. KMO and Bartlett tests were applied for all of the adjusted scale items.

**Table 1**

*KMO and Bartlett's test results*

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.947
Bartlett's Test of Sphericity	Approx. Chi-Square	15249.364
	Df	465
	Sig.	0.000

**Source:** Authors's database.

In the interpretation of the KMO value, the value of 0.60 is proposed as the minimum value for a good factor analysis (Tabachnick & Fidell, 2013). The significance level of Bartlett's Test of Sphericity is 0.000 (for  $p \leq 0.05$ ) indicates that the data is consistent with factor analysis. In the study, the variables prepared according to the 5 Likert scale were measured with a questionnaire form of 40 questions. Variables subjected to factor analysis along with factor loads are presented in Table 2.

**Table 2**

*Confirmatory factor analysis results*

	Factor Loadings	Indicator Reliability	P value
I1. In the company where I work, there is an organizational structure based on specialization.	0.722	0.521	0.000
I2. In the event that any of our managers are not in the company where I work, our work continues without disruption.	0.780	0.608	0.000
I3. In the company where I work, our managers adapt to the expectations of change.	0.646	0.417	0.000
I4. Carries out a systematic study in order to be accepted as a corporate company around the company where I work.	0.734	0.539	0.000
I5. The company in which I work is acting according to international norms of products or services (rules).	0.766	0.587	0.000
I6. The company I work for is clear (transparent) on everything to its stakeholders (shareholders, clients, public institutions, etc.).	0.693	0.480	0.000
I7. Our corporate culture is transferred to our new employees by our former employees.	0.776	0.602	0.000
I8. The company I work for cares about being a respected company in the eyes of society.	0.770	0.593	0.000
I9. The activities of all departments in the company I work are consistent with the goals of the established company.	0.741	0.549	0.000
I10. The basic values of the company I work for are compatible with the personal values of the employees.	0.709	0.503	0.000
IC1. Promotions, creativity, initiative and innovation are supported in the company where I work.	0.797	0.635	0.000
IC2. In the company where I work, it is appreciated for producing ideas and experimenting with the idea.	0.825	0.681	0.000
IC3. In the company I work for, the development and support of teamwork is given much importance.	0.751	0.564	0.000
IC4. There is a participating working environment in the company where I work.	0.774	0.599	0.000
IC5. In the company where I work, things are sought to be done better than traditional methods.	0.776	0.602	0.000
IC6. In my company, everyone can access all the information they need.	0.794	0.630	0.000
IC7. Working groups in my company consist of members with different skills, abilities and expertise.	0.659	0.434	0.000
IC8. Employees at the company where I work have a word about what kind of training they will receive.	0.817	0.667	0.000
IC9. Employees at the company where I work have initiative in organizing and conducting work.	0.826	0.682	0.000
IC10. The company I work with has flexible business applications (e.g. business rotation, flexible hours, business sharing).	0.744	0.554	0.000
IC11. In the company where I work, all decisions are taken with the participation of all levels at all levels.	0.795	0.632	0.000
SC1. Our company has been competitive in costs for the last three years.	0.658	0.433	0.000
SC2. Our company maintains its reputation for product quality for the last three years	0.856	0.733	0.000
SC3. Our company has sustainable profitability targets for the last three years.	0.856	0.733	0.000
SC4. Our company has regular sales growth for the past three years.	0.823	0.677	0.000
SC5. Our company has been providing customer satisfaction for the last three years.	0.769	0.591	0.000
SC6. Our company has had a competitive market share for the past three years.	0.626	0.392	0.000
RI1. The innovations presented in my company involve significant improvements over previous technology	0.833	0.694	0.000
RI2. The innovations presented in the company where I work allows products to emerge that cannot be rivals with old technologies.	0.866	0.750	0.000
RI3. The innovations presented in the company I work for bring fundamental changes to consumption habits in the market.	0.872	0.760	0.000
RI4. Innovations in the company I work for include fundamental changes that will leave competitors in a difficult situation on the market.	0.860	0.740	0.000

**Notes:** IC: Innovation Culture, RI: Radical Innovation, I: Institutionalization, SC: Sustainable Competition, \*: p value less than 0.001.

**Source:** Authors's database.

The resulting factor loads and some reliability measurements are given in Table 2. Confirmatory factor analysis (CFA) is used to check whether expressions provide the existing structure along with the factors, and the factor loads obtained in the results of the analysis indicate to what degree it is associated with factors. At the same time, if the resulting factor loads are meaningful, in addition to a statistically significant relationship with the factors, all P Value results are less than 0.001. Compliance values obtained from the model generated as a result of the CFA made in Lisrel program (RMSEA: 0.061; NFI: 0.97; NNFI: 0.93; CFI: 0.95; GFI: 0.94; IFI: 0.94). RMSEA value is  $0 \leq \text{RMSEA} < 0.10$ ; NFI value  $\geq 0.90$ ; NNFI value  $\geq 0.90$ ; The CFI value is  $0 \leq \text{CFI} < 0.10$ ; GFI value is  $0 \leq \text{GFI} < 0.10$ ; IFI value  $\geq 0.90$  indicates that the model has good fit (Erkorkmaz et al., 2013; Sönmez Çakır & Adigüzel, 2020).

**Table 3**

*Reliability and model fit values of the factors*

Factors	N	Mean	Std. Deviation	Cronbach Alpha ( $\alpha$ )	AVE	CR	Correlations			
							IC	SC	RI	I
IC	11	4.21	0.81	0.880	0.61	0.94	1			
SC	6	4.09	0.72	0.856	0.59	0.90	0.613**	1		
RI	4	4.19	0.67	0.879	0.74	0.92	0.547**	0.523**	1	
I	10	4.05	0.69	0.903	0.54	0.92	0.517**	0.571**	0.557**	1

**Notes:** IC: Innovation Culture, RI: Radical Innovation, I: Institutionalization, SC: Sustainable Competition.

**Source:** Authors's database.

In Table 3, the reliability values of the factors and correlations with AVE and CR values are given. It is desirable that Cronbach Alpha coefficients are above 0.80, AVE values greater than or equal to 0.50 CR values are greater than both their AVE values and 0.70. When examining the AVE and CR values and Cronbach Alpha values, it can be determined that the scale is a very reliable and compatible model. All calculated Correlation sig values were less than 0.01.

Regression analysis was used to test predicted all research hypotheses. Linear regression equations have been established to see the effects of the argument on the dependent variable. The results of simple, multiple and mediator effect analyses are obtained from the SPSS PROCESS 3.4 plugin. Table 4 shows whether hypothesis and hypotheses tested are supported in this analysis.

**Table 4**

*Regression analysis results of impact of independent variables on dependent variables*

Hip.	Independent Variables	Dependent Variables	Std. $\beta$	Sig.	Adjusted R Square	F Value	Reject/ Accept
H1	IC	SC	0.613	0.000	0.375	457.445	Accept
H2	IC	I	0.517	0.000	0.266	276.917	Accept
H3	I	SC	0.571	0.000	0.325	367.206	Accept
H4	RI	SC	0.523	0.000	0.272	286.061	Accept
H5	RI	I	0.557	0.000	0.309	342.352	Accept

**Notes:** IC: Innovation Culture, RI: Radical Innovation, I: Institutionalization, SC: Sustainable Competition , \*\*\*:  $p < 0.001$ .

**Source:** Authors’s database.

Table 4. shows the effect of the independent variable on the dependent variable: Shallow. A value less than 0.05 indicates a significant regression at the 0.05 significance level. R square values show how much of the change in the dependent variable can be explained by the independent variable. F value values show the significance of the equation as a whole. With these results, it can be said that all hypotheses are accepted.

The effect of two arguments on a dependent variable was also examined by linear regression. The results obtained are given in Table 5. After analyzing the effect of arguments on the dependent variable at the same time, mediator effect analysis was passed. In the analysis of the SC dependent variable, multiple regression analysis was performed to see the direct and indirect effects of the two independent variables and the total effects.

**Table 5**

*The effect of the mediation variable according to regression analysis results*

Independent Variables	Dependent Variables	Standard $\beta$	Sig.	Adjusted R Square	F Value
IC	SC	0.346	0.000	0.462	328.212
I		0.434	0.000		
RI	SC	0.297	0.000	0.385	239.244
I		0.405	0.000		

**Notes:** IC: Innovation Culture, RI: Radical Innovation, I: Institutionalization, SC: Sustainable Competition , \*\*\*:  $p < 0.001$ .

**Source:** Authors’s database.

A test developed by Hayes analyzed the effects of mediation variables. This test has confidence intervals instead of P value. The results are interpreted by looking at these confidence intervals. Between BOOTLLCI and BOOTULCI numeric values calculated for each model, a meaningful mediation effect is mentioned if there is no zero value (Hayes, 2009).

**Table 6**

*Hayes test results*

	Mediator Variables	X and Y	Effect	BootSE	BootLLCI	BootULCI	Reject/Accept
H 6	I	IC and SC	0.1790	0.0253	0.1243	0.2239	Accept
H 7	I	RI and SC	0.2256	0.0267	0.1751	0.2813	Accept

**Notes:** IC: Innovation Culture, RI: Radical Innovation, I: Institutionalization, SC: Sustainable Competition  
**Source:** Authors’s database.

When the test developed by Hayes was used for mediator effect, the results in Table 6 were obtained. In this test, no interpretations with p values are used for interpreting BootLLCI and BootULCI values. The degree of influence of I in the relationship between IC and SC was found to be 0.179 for the H6 hypothesis. The BootLLCI value is 0.1243 and the BootULCI value is 0.2239. Since there is no zero digit between these two numbers, it can be said that I has a mediator effect in the relationship between IC and SC. Likewise, in the H7 hypothesis, the degree of influence of I in the relationship between RI and SC was found to be 0.2256. The BootLLCI value was 0.1751 and the BootULCI value was 0.2813. Since there is no zero digit between these two numbers, I can say that the relationship between RI and SC has a mediator effect.

**5 Discussion**

It can be argued that the achievement of sustainability, which is one of the three objectives of enterprises, depends on the successful implementation of continuous innovation activities because it is difficult for the companies lagging behind innovation activities to stay in the sector and market. Examples of this situation are companies like Nokia, Motorola, and Panasonic, all of which were late in their innovation activities, so they had to leave their markets to their competitors. At the same time, internet companies (e-commerce and social networks) and financial firms come to the fore when looking at the developments in the service sector.

The successful execution of novel ideas are crucial for businesses, so companies need to adopt innovation as a culture and have the power to do radical innovation for its operations, regardless of the sector. In emphasizing the ideal organization and the importance of leadership in creating an ideal organizational culture, Martins (1987) developed a model for describing organizational culture. Martins (1987)'s model is based on the interaction between organizational subsystems (goals and values, structural, managerial, technological, and psycho-sociological subsystems) and dimensions of two vital functions, namely the external environment (social, industrial and corporate culture) and internal systems (artifacts, values and basic assumptions) and culture. In an environment where change is

continuing, organizations and leaders should strive to create an institutional framework where creativity and innovation are considered fundamental cultural norms.

Openness and confidence in the process of change are an important element in the emergence of change (Deal & Kennedy, 1982). Senge et al. (1999) supports this statement by pointing out that open change (developing a true spirit of transparency and trust) often plays a critical role in deep change processes. The culture of innovation comes to the forefront of these changes. The research results show that innovation culture positively affects both institutionalization and sustainable competition. However, in the research conducted by Shih (2018), it was stated that radical innovation has no effect on business performance. But, Domínguez-Escrig et al. (2019) stated in their research that radical innovation positively affects innovation success. It is necessary to consider whether a company with innovation success will be successful in both financial and marketing performance. Aksoy (2017) states that innovation culture has a positive effect on both marketing innovation performance and product innovation performance. So, a lack of innovation results in companies that lag behind the competition. This is because the innovation culture covers all kinds of activities necessary to provide value to customers and ensure a satisfactory return of the company (El Harbi et al., 2014).

As Buckler (1997) suggested, “innovation is an environment that exists in a firm, a culture that is almost a “spiritual force” driving the process of creating value. When looking at companies that are successful in innovation culture and radical innovation, it can also be argued that there are company institutionalization guidelines for this culture. According to the definition of Kanter (1984), innovation is “the introduction, acceptance and implementation of new ideas, processes, products and services.” Hence, innovations could be either the single major breakthrough for a totally new product or service, or it could be a series of small, incremental changes.

As a result of analyzing the surveys collected from smartphone companies where the research was conducted, the success of sustainable competition depends on innovation activities. In other words, for an organization to be innovative, the creation of creative ideas by creative people is not enough, the culture of creativity needs to be accepted and implemented. Thus, it can be expected that organizational features, in addition to the personal characteristics of members of the organization, will play an important role in promoting and developing innovation (Arad et al., 1997). Radical innovation, namely destructive innovation in the sense of innovation and demanding firms, are able to guide the sector in which they are located. Thanks to radical innovations, such companies can both gain a strong position in the institutional sense and gain an advantage in sustainability.

## 6 Conclusion

Creating an innovation culture with the capacity to do radical innovation positively affects a company’s direction. However, in order for firms to be successful in innovation, it is necessary to be able to respond to the demands and needs of consumers first. Indeed, in order to create this kind of



innovation culture, the organizational structure itself needs to be created within a creative and innovative thinking structure.

Companies must pay attention to economic perspective, business management strategy perspective, and internal activities of the organization in order to be successful in the innovation process. This is especially true since, in creating innovation culture and achieving success in radical innovation, a good understanding of management should be adopted in terms of both economic, strategic, and organizational structure. It is important to remember that firms are both in cooperation with and competing with other companies, and just as importantly, all individuals in the company affect the innovation process. Innovation should not be taken lightly. For example, Arsawan et al. (2020), stated that the innovation culture positively affects sustainable competitive advantage. Innovation is a multifaceted and complex process that must be adopted by all employees of the organization (Tellis et al., 2009). Although the research results are positive in terms of institutionalization and sustainability, different results are likely to be obtained in different sectors and different firm structures. Therefore, there is a need to develop work in different cultures and in different firm structures as innovation culture is the most fundamental determinant of innovation. The culture that should be compatible with the content of the organization refers to the forms of regulation and behavior in which the people working on solutions to problems are unanimous in their directional targets (Roffeei et al., 2016). Therefore, as a result of the research, companies must carry out their innovation activities in order to continue their activities and at the same time help radical innovation successfully manage the internal dynamics of the organization, as well as keep pace with the conditions of the environment in which they are located. Indeed, firms respond to the expectations of structures in which they interact, such as government institutions, customers, suppliers and competitors. As companies respond to these expectations, they gain legitimacy for their activities by adapting to their environment using an innovation-based environment (Apaydin, 2007).

Since the constraints of the research are carried out on firms located in a particular sector, and at the same time data from administrative personnel (white collar) was collected, it is likely that there will be a difference in the results obtained from the data collected from employees in blue collar positions. Therefore, interpreting the analysis based on the differing sectors and performing a comparative analysis would be a useful literature contribution.

### Authors' contributions

Contribution	Adiguzel, Z.	Sonmez Cakir, F.	Kalyar, M. N.
Contextualization	X	X	-
Methodology	-	X	-
Software	-	X	-
Validation	X	X	-
Formal analysis	X	X	-
Investigation	X	X	X
Resources	X	X	X
Data curation	X	X	X
Original	X	X	X
Revision and editing	X	X	X
Viewing	X	X	X
Supervision	X	-	-
Project management	X	-	-
Obtaining funding	X	X	X

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