

**Research Article**

**The Relationship Between Green Culture and Green Innovation In Organizations: A Meta-Analytic Review**

*İşletmelerde Yeşil Kültür ve Yeşil İnovasyon Arasındaki İlişki: Bir Meta-Analitik İnceleme*

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**Abstract**

Green culture, which emerged with the environment-oriented preferences of consumers as a result of the negative effects of global warming and changing climate, makes modern businesses that can make green innovations more advantageous in competition. Green culture and green innovation serve the sustainability goals of businesses. For this reason, the concepts of green innovation and green culture have emerged as two important concepts that attract the attention of businesses. Green innovation refers to environmentally friendly approaches in products, services and production processes. Green culture refers to employees' values, beliefs and behaviors towards the environment. The aim of the study is to bring together the results of different academic researchers in the literature and to reveal the effect size between green culture and green innovation in enterprises by meta-analysis method. Among the studies included in the study, 6 works compiled from Web of Science, Google Scholar, Scopus, ProQuest, PubMed databases were included in the study. As a result of the analysis, a moderate effect size of 0.566 was found in the relationship between green culture and green innovation. There is a positive relationship between the two concepts.

**Keywords:** Business, Green Culture, Green Innovation, Meta-Analysis, Sustainability

**Öz**

Küresel ısınma ve değişen iklimin olumsuz etkileri sonucu tüketicilerin çevre odaklı tercihleri ile ortaya çıkan yeşil kültür, yeşil inovasyon yapabilen modern işletmeleri rekabette daha avantajlı hale getiriyor. Yeşil kültür ve yeşil inovasyon, işletmelerin sürdürülebilirlik hedeflerine hizmet ediyor. Bu nedenle yeşil inovasyon ve yeşil kültür kavramları işletmelerin dikkatini çeken iki önemli kavram olarak ortaya çıkmıştır. Yeşil inovasyon, ürün, hizmet ve üretim süreçlerinde çevre dostu yaklaşımları ifade etmektedir. Yeşil kültür ise çalışanların çevreye yönelik değer, inanç ve davranışlarını ifade etmektedir. Çalışmanın amacı, literatürde yer alan farklı akademik araştırmacıların sonuçlarını bir araya getirmek ve meta-analiz yöntemi ile işletmelerde yeşil kültür ve yeşil inovasyon arasındaki etki büyüklüğünü ortaya koymaktır. Çalışmaya dahil edilen çalışmalar arasında Web of Science, Google Scholar, Scopus, ProQuest, PubMed veri tabanlarından derlenen 6 eser çalışmaya dahil edilmiştir. Analiz sonucunda yeşil kültür ile yeşil inovasyon arasındaki ilişkide 0,566'lık orta düzeyde bir etki büyüklüğü bulunmuştur. İki kavram arasında pozitif bir ilişki vardır.

**Anahtar Kelimeler:** İşletme, Yeşil Kültür, Yeşil İnovasyon, Meta-Analiz, Sürdürülebilirlik

**1. INTRODUCTION**

The "United Nations Sustainable Development Goals" were adopted in 2015 to solve global sustainability problems. 17 goals and 169 targets adopted by 193 member states aim to tackle the deteriorating socio-economic, environmental and climate crisis in the world by 2030 (Hawkes & Popkin, 2015). The twelfth of these goals is Responsible Consumption and Production. On the production side, businesses are encouraged to make green production by using natural resources efficiently. Energy efficiency in production processes,

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halving global food waste, and making products and services environmentally friendly were announced as a responsibility for businesses (Pauliukevičienė & Stankeviciene, 2022). Furthermore, the awareness regarding global warming and environmental problems in societies has also affected customer preferences as green consumption preferences (Sheth et al., 2011). Another effect is the legal regulations introduced by countries within the scope of environmentally friendly production in businesses (Porter & Derry, 2012). As a result of these developments, the concepts of environment and sustainability have become issues that businesses take into account in their production processes. The concepts of green culture and green innovation have emerged in enterprises that provide information and awareness regarding human resources on green production and operate in the context of circular economy with waste management system (Asif et al., 2011).

Green culture refers to the culture formed because of the internalization of environmental sustainability and its requirements by employees in businesses. Green culture also means that environmental decisions are effective in the development of business strategies and business processes (Abbas & Khan, 2023a). While environmentally friendly practices are encouraged within the organization, awareness seminars with sustainability principles are held.

Green cultural behaviors are adopted from the lowest level to management levels (Hooi et al., 2022). Organizations with a green culture start first with training on environmental awareness and sustainability for their employees. Businesses invest in green technologies to manage waste, protect natural resources and reduce carbon footprint. In this direction, innovative products and services that are less harmful to the environment and can be made from recyclable materials are developed (Wang, 2019). As a result, the green innovation process is realized in organizations. Green innovation refers to the introduction of environmentally friendly products and services in line with developing technologies (Schiederig et al., 2012).

Creating value for businesses by implementing creative business ideas is possible through innovation (Ortiz-Villajos & Sotoca, 2018). With global warming and environmental problems threatening human life, it has become the responsibility of businesses to produce products and services based on green innovation (Chang & Chen, 2013). Organizations achieve environmental goals through green innovation. Innovations are made by businesses in order to reduce the ecological footprint in production processes (Arici & Uysal, 2022). Green innovation ensures cost reduction, energy saving, pollution prevention and therefore customer satisfaction (Agrawal et al., 2024a).

This study presents a meta-analysis examining the relationship between green culture and green innovation in organizations. Green culture refers to an organizational structure in which employees adopt environmental awareness and sustainability-oriented strategies are developed, while green innovation is related to environmentally friendly products, services and production processes. In this context, the aim of the study is to bring together the results of different studies in the literature and to reveal the effect size between these two concepts.

The contribution of the study to the literature is the quantitative evaluation of the relationship between the concepts of green culture and green innovation through meta-analysis method. In addition, bringing together different academic studies in the literature and presenting a holistic framework in terms of the relationship between the two concepts constitutes the unique structure of the study.

The effect size of the mutual relationship between the concept of green culture and the concept of green innovation is revealed by analyzing the results of different studies in the literature. The collected data were analyzed by selecting the meta-analysis method through Jamovi software. Six studies from the Web of Science, Google Scholar, Scopus, ProQuest, and PubMed databases were included in the study. According to the results of the meta-analysis, the effect size relationship between green culture and green innovation is 0.566 and of medium strength. In the light of this information, the study consists of six stages. The first stage is the introduction, the second stage is the conceptual framework, the third stage is the development of the purpose and hypotheses, the fourth stage is the research method, the fifth stage is the findings and the last stage is the conclusion.

## **2. LITERATURE REVIEW**

### **2.1. Green Culture**

Sustainability policies have shaped production processes and led to environmentally friendly approaches within businesses (Dasawat & Sharma, 2023). The main source of sustainable society is green culture in enterprises, green innovation and green financial instruments that form the funding part (Agrawal et al., 2024). As key players in this process, businesses play an important role in achieving global green goals. Reducing

carbon footprint, energy saving and recyclable products are some of these green goals (Yuliantini et al., 2023). In organizations managed in line with environmental strategies, employee training and circular economy sensitivities have brought along a new organizational culture (Ahmad et al., 2023). This green culture concept means that sustainability principles are adopted in production processes from the lowest level to the top managers within the organization (Aggarwal & Agarwala, 2023). Green culture refers to the creation of an organizational culture in which employees in businesses focus on environmentally sensitive attitudes and sustainability principles. This culture is supported by activities such as training, awareness programs, and recycling practices. In addition, businesses that adopt a green culture optimize waste management with circular economy approaches (Noor Faezah vd., 2024). (Wu vd., 2016; Aukhoon vd., 2024; Sun vd., 2024; Vargas-Hernández vd., 2024). In green culture, an important aspect of sustainable development, environmental values are included in organizational culture. Awareness of green culture is promoted through the production of environmentally friendly products and services that are beneficial to the natural environment (Shahriari et al., 2023). In order to minimize environmental damage, monitoring and control stages are carried out by analyzing the ecological effects of production activities (Alkhodary, 2023). Green innovation efforts are more common in organizations with a green culture. Eco-friendly and reuse-recycle features of innovative products and services emerged through green innovation in a green culture (Wang et al., 2022). Organizations with a green culture have many advantages. First, with the change in generations, the change in customer preferences evolved towards more sustainable products. For this reason, awareness regarding green culture gains importance in the production of environmentally friendly products. Another advantage is that it increases the competitiveness of businesses. Businesses with green culture can survive in the market with their preferability aspects. Costs are reduced by providing efficiency and energy savings (Sun et al., 2024).

Top management support is an important contribution to the spread of green culture in enterprises. The necessary resources should be provided by the top management in order to achieve green culture goals in line with the strategies of the businesses (Alawneh et al., 2024) Through trainings in organizations, environmental awareness should be raised at regular intervals to cover the entire base. Businesses should continue their green culture activities not only in their internal environment but also in the entire value chain with external stakeholders. Information management is critical in creating green culture in businesses (Muisyo et al., 2022). In all stages from green innovation to green product, awareness is raised through information (Yeşiltaş et al., 2022). While environmentally friendly products and services that are developed as a result of the activities of businesses define that business as a green business, green culture is the thoughts and values that organizational members adopt towards the natural environment within the business (Qalati et al., 2023). While green business and green culture concepts support each other, green innovation contributes to sustainable goals. Green financial resources, green innovation and green investments should be prioritized for developing and sustaining a green culture.

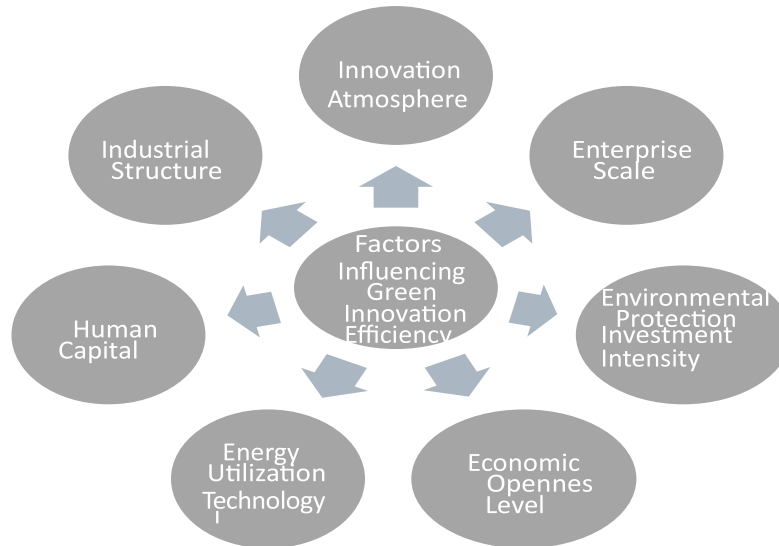
## **2.2. Green Innovation**

Radical influences such as Industry 4.0 and COVID-19 have caused major transformations in societies (Spieske & Birkel, 2021). Innovations in the last decade unified global borders and created today's digital societies. Also reflected in customer demands and needs, innovative changes accelerated the transition from traditional methods to digital platforms (Saleem et al., 2024). While the innovation process, defined as innovations in products and services, is considered as an important step in creating value propositions, sustainable goals can be ignored (Ochuba et al., 2024). Social sensitivities and regulations resulting from global warming and environmental degradation encourage businesses to green innovation (Azmat et al., 2023).

Innovations made in product and production processes to achieve environmental goals are green innovation processes. Reducing environmental footprints in enterprises is one of the most important achievements of this process. One of the other achievements that green innovation brings to businesses is resource efficiency. Savings on energy consumption and waste recycling lead to cost reduction while at the same time reducing the negative impacts on the environment (Begum et al., 2022; Yu et al., 2021; Wu et al., 2022). Green innovation involves the development of environmentally friendly products and services, and the adoption of methods that provide energy savings and resource efficiency in production processes. This concept is a critical factor in both reducing costs and providing businesses with a competitive advantage. Companies that support green innovation increase brand value and consumer loyalty in the long term (Xu vd., 2024; Bataineh vd., 2024; Reischauer vd., 2025; Hong vd., 2024). Green innovation also gives businesses a competitive advantage. Today's consumer preferences are evolving towards green products and services. In this context, being a preferable business is possible with green innovation. Businesses that realize their green innovation in line with sustainable goals maintain their existence in the market as more preferable organizations and gain

competitive advantage (Tu & Wu, 2021). Green innovation-oriented development strategies are created by senior managers of businesses (Aftab et al., 2023). The transition from planning and resource allocation to the implementation phase reveals the components of green innovation efficiency. Green innovation components are presented in Figure 1.

Reference: Sun et al., 2022: 10



**Figure 1: Green Innovation Efficiency**

One of the factors influencing green innovation is the innovation atmosphere. Green culture is one of the most important dynamics of this atmosphere. Enterprise scale, environmental investments, economic openness level, use of energy technology, human capital and industrial structure are other factors (Sun et al., 2022). Green innovation is the foundation of sustainable growth and green strategies (Geng et al., 2023). Green innovation efforts applied in digital businesses offer the opportunity to achieve sustainability goals while minimizing environmental damage (Ni et al., 2023).

One of the most important components of the green innovation process is the establishment of product research and development centers within businesses (Jiang et al., 2024). Establishing green finance budgets and scientific studies are necessary processes for proper green innovation management (Zhang, 2023). Green innovation is divided into two as green product innovation and green process innovation. Green product innovation refers to the application of innovative ideas while designing new products to reduce the harmful effects of existing products on the environment. Green process innovation, on the hand, refers to the adoption of managerial practices in the implementation of ecological production processes and the implementation of innovative ideas (Ahmed et al., 2023). The important ground for green innovation in organizations is to create a green culture.

### 2.3. Green Culture and Green Innovation

In the light of previous studies, the concepts of green culture and green innovation support each other and have a positive relationship (Sharma et al., 2021). Taking their place as a responsibility in businesses, these two concepts gained importance within the scope of the United Nations' "17 Sustainable Development Goals" created by the "2030 Agenda for Sustainable Development", adopted in 2015 and entered into force in 2016 (Abbas & Khan, 2023). Climate change, environmental problems and changes in consumer preferences have shaped green innovation and green culture policies. These concepts have many similar gains when managed with the right strategy in organizations. While providing energy savings and efficiency, they cause costs to decrease. In addition to competitive advantage in the market, environmental damage is minimized in production processes (Takalo et al., 2021).

Sustainable environmentally friendly approaches are possible in organizations through green culture and green innovation (Awan et al., 2023). Green culture is a measure of adoption of environmental awareness and goal achievement practices in an organization. Businesses that adopt green culture develop production processes that give the least damage to the environment (Bai et al., 2024). Green innovation creates innovative products and services that are compatible with environmental sustainability. This concept also has benefits for

businesses. In addition to providing brand reputation, it provides competitive advantage in the market (Chang, 2011). Businesses with a green culture tend to be better motivated to make green innovations (Morelli, 2023). Organizations that internalize green culture support green innovation strategies. Green culture and green innovation strengthen corporate image as environmentally friendly businesses (Sepahvand et al., 2023). As a result, sustainable businesses should include green culture and green innovation practices to contribute positively to environmental problems and meet consumer demand. Studies in the literature reveal that green culture encourages green innovation. In particular, the adoption of environmentally friendly practices within the organization increases employee motivation for green innovation and strengthens corporate sustainability strategies (Hafeez vd., 2024; Lin vd., 2024; Şengüllendi vd., 2024; Suleman vd., 2024; Zahir vd., 2025)

### 3. PURPOSE IMPORTANCE AND DEVELOPMENT OF HYPOTHESES

The study presents a meta-analysis that examines the relationship between green culture and green innovation in businesses. Green culture refers to the development of sustainable strategies by adopting environmental awareness among employees. Green innovation is related to environmentally friendly products, services and processes. In this context, the aim of the study is to bring together different studies in the literature and reveal the magnitude of the effect between these two concepts.

Accordingly, two hypotheses were formed.

H<sub>0</sub>: There is no relationship between green culture and green innovation.

H<sub>1</sub>: There is a significant relationship between green culture and green innovation.

### 4. METHOD

The meta-analysis method is a statistical method of analyzing the results of different studies and combining their results with the results of a study on a specific subject. The present study aimed to reveal the effect size between the concepts of “Green Culture” and “Green Innovation” by making inferences and combining the results of different studies previously obtained by using the meta-analysis method. The data used in the meta-analysis method included the examination and evaluation of previously published studies. Due to the use of secondary data in the study, ethics committee permission was not required, thus not taken. The six studies included in the present research were taken from the Web of Science, Google Scholar, Scopus, ProQuest and PubMed databases. The included studies were filtered from the Web of Science database.

The first study was conducted by Wang et al. (2022) with 351 managers working in the manufacturing and service sectors and found a relationship between green culture and green innovation at  $\beta=0.260$ .

The second study was conducted by Gürlek and Tuna (2018) with 293 managers and 192 employees in the hotel sectors and found a relationship between green culture and green innovation at  $\beta=0.630$ .

The third study was conducted by Chao-Hung Wang (2019) with 327 employees in manufacturing sectors and a relationship between green culture and green innovation was found at  $\beta=0.750$ .

The fourth study was conducted by Xiaoyi et al. (2023) with 339 managers in textile sectors and a relationship of  $\beta=0.131$  was found between green culture and green innovation.

The fifth study was conducted by Roespinoedji et al., (2019) with 379 managers in manufacturing sectors and a relationship of  $\beta=0.281$  was found between green culture and green innovation.

The sixth study was conducted by Machado and Avila (2019) with 157 employees in automotive sectors and a relationship between green culture and green innovation at  $\beta=0.885$  level was determined.

The data used in the meta-analysis method were obtained by systematically examining and combining previously published scientific studies. In this study, secondary data, which included data appropriate to the research questions and selected according to the specified criteria, were used. Therefore, ethics committee approval was not required as no data were collected directly from any human participants. Data were obtained through a comprehensive literature search in the identified databases (Web of Science, Google Scholar, Scopus, ProQuest and PubMed). During the search process, appropriate studies were selected using relevant keywords, subject headings, and inclusion/exclusion criteria. The full texts of the selected studies were accessed, the data were systematically analyzed and those suitable for meta-analysis were identified. The following criteria were taken into consideration during the inclusion process. The six selected studies were included in the meta-

analysis as a result of their publication year and currency, methodological soundness of the studies, direct relevance to the research topic, and presentation of statistical data in a format suitable for meta-analysis.

The selected studies were statistically analyzed with the Jamovi software's major module. Correlation coefficient and sample size data were taken into consideration for the analysis.

This study combines the results of different academic studies using meta-analysis method to reveal the effect size of the relationship between green culture and green innovation. In line with the purpose and subheadings of the study, 6 studies were selected from Web of Science, Google Scholar, Scopus, ProQuest and PubMed databases and analyzed with Jamovi software.

Correlation analysis was preferred in this study because correlation is an effective method to measure the direction and strength of the relationship between two variables. In order to understand the relationship between green culture and green innovation in line with the research purpose, it is necessary to determine the linear relationship between the variables. In addition, in order to provide an integrated evaluation of the data obtained from different studies within the scope of the meta-analysis method, the correlation analysis tool in the Jamovi software was used. Correlation analysis is one of the most appropriate analysis methods to determine significant relationships between data sets and to test the general validity of these relationships.

#### 4. FINDINGS

Six studies were analyzed by meta-analysis method and the effect size between green culture and green innovation concepts was determined. The data obtained were evaluated within the scope of the random effect model. The restricted maximum likelihood estimator was used to determine the amount of Tau Heterogeneity ( $\tau^2$ ) (Viechtbauer, 2010). In addition to the  $\tau^2$  estimation, Q-test and  $I^2$  results were also presented for heterogeneity testing. If heterogeneity is detected ( $\tau^2 > 0$  regardless of the results of the Q-test), the estimation data are also shown.

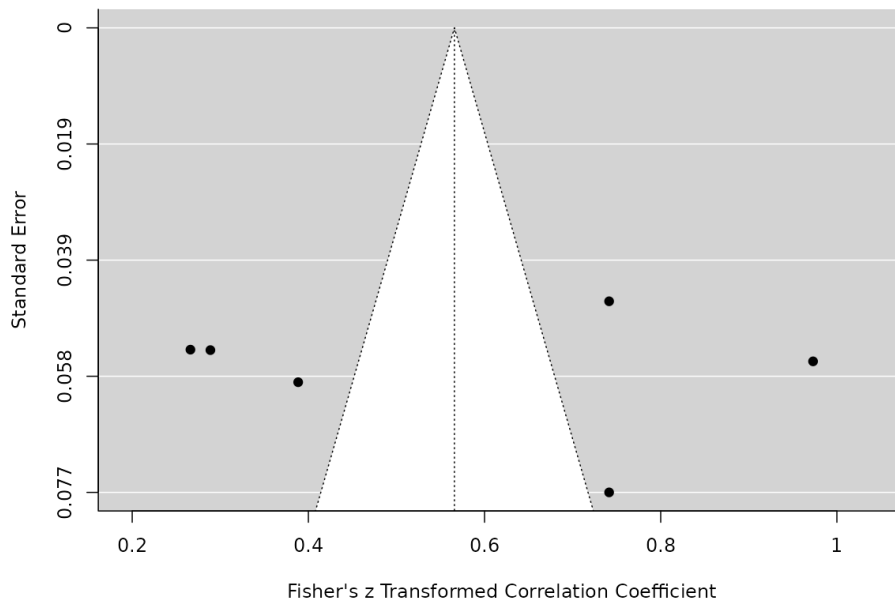
As a result of the analysis, there is a moderate positive relationship of 0.566 between green culture and green innovation. With this effect, the  $H_0$  hypothesis of the study, that there is no relationship between the concepts of green culture and green innovation, is rejected. The  $H_1$  hypothesis of the study, that there is a significant relationship between green culture and green innovation, is accepted. Heterogeneity test results were calculated as  $\tau = 0.287$ ,  $\tau^2 = 0.0822$ ,  $I^2 = 96.34\%$  and it was seen that heterogeneity was high. No significant publication bias was found in the publication bias tests (Begg & Mazumdar, Egger's Regression).

Studentised residuals and Cook's distances were used to detect outliers. According to the Q-test, the results of the study are heterogeneous ( $Q(5) = 140.6285$ ,  $p < 0.0001$ ,  $\tau^2 = 0.0822$ ,  $I^2 = 96.3415\%$ ). Values related to heterogeneity are presented in Table 1.

**Table 1: Results Regarding the Heterogeneity Test**

<b>Tau</b>	<b>Tau<sup>2</sup></b>	<b>I<sup>2</sup></b>	<b>H<sup>2</sup></b>	<b>R<sup>2</sup></b>	<b>df</b>	<b>Q</b>	<b>p</b>
0.287	0.0822 (SE= 0.0541)	96.34%	27.334	.	5.000	140.629	<.001

After the analysis, the Fisher value was converted from r to z and presented as a correlation coefficient. The regression analysis used the correlation test and standard error to predict the observed results, which is illustrated by a funnel plot shown in Figure 2.



**Figure 2: Funnel Chart**

As in the data presented in Figure 2, a heterogeneous distribution was determined with 6 works included in the analysis. The correlation coefficients range from 0.2661 to 0.9730, all of which are positive. Furthermore, the Fisher transformation from  $r$  to  $z$  was used and the estimated mean correlation coefficient based on the random effects model was 0.566. More details on the correlation can be found in Table 2.

**Table 2: Results of the Correlation Test**

	Estimate	se	Z	p	CI Bound	CI Upper Bound
<b>Intercept</b>	0.566	0.119	4.74	<.001	0.332	0.800

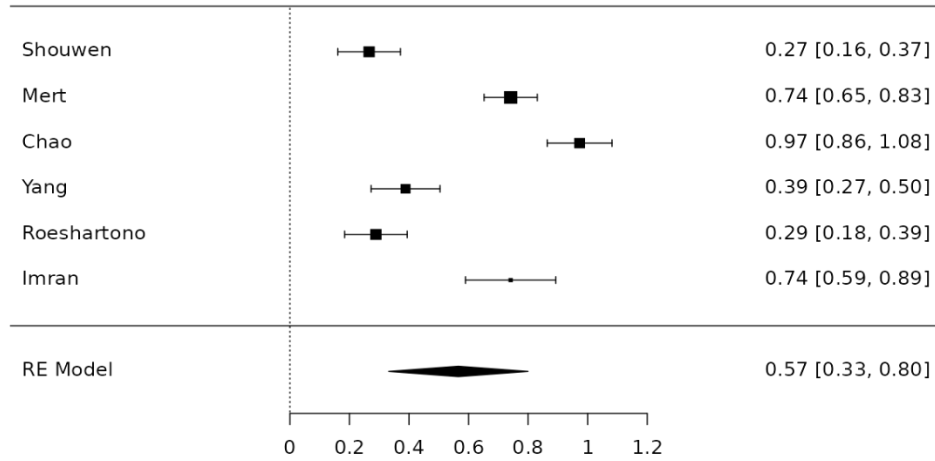
*Not.* Random-Effects Model (k = 6)Tau<sup>2</sup> Estimator: Restricted Maximum-Likelihood

The mean estimate based on the random effects model was transformed from Fisher R to Z and the correlation coefficient  $\hat{\mu} = 0.5658$  (95% CI: 0.3318 - 0.7998). Therefore, the mean result was critically divergent from zero ( $Z = 4.7386$ ,  $p < 0.0001$ ). The data based on the Q-test were heterogeneous ( $Q(5) = 140.6285$ ,  $p < 0.0001$ ,  $\tau^2 = 0.0822$ ,  $I^2 = 96.3415\%$ ). The detected results are given as 95% estimate levels between -0.0428 and 1.1744. No study for prioritised residuals shows a value greater than  $\pm 2.6383$ , so there are no results for outliers in the model.

**Table 3: Publication Bias Test Results**

Test Name	value	p
Fail-Safe N	1338.000	<.001
Begg and Mazumdar Rank Correlation	0.200	0.719
Egger's Regression	0.319	0.749
Trim and Fill Number of Studies	0.000	.

The  $p = 0.7194$  and  $p = 0.7494$ , respectively, indicate that there was no publication bias. For easier understanding of the analysis and procedures, the forest plot is presented in Figure 3.



**Figure 3: Forest Plot**

The meta-analysis analysis result determined a moderate relationship of 0.566 between the concepts of “Green Culture” and “Green Innovation”. With the study, the results of many studies were analyzed in a single program and a relational evaluation of the effect size was provided.

**5. CONCLUSION**

Dominating sectors, digital transformation and sustainability principles have become two important issues globally. While modern organizations respond to customer needs with technological processes as a result of digital transformation, their ecological footprint has a great impact on the environment. The change in customer segmentation over time and the awareness of leaving a livable legacy to future generations have brought businesses with a green culture and green innovation to the forefront.

In this context, green culture is the degree of adoption of environmentally friendly approaches in production processes, while green innovation is innovative products and services in production processes in line with sustainable goals. While businesses with green culture gain energy efficiency and competitive advantage, businesses that can make green innovation can maintain their existence in the market with cost minimization. The present study determined that “Green Culture” and “Green Innovation” practices positively affect each other in terms of effect size and relational dimension.

As a result of the meta-analysis, a moderate positive relationship of 0.566 was found between green culture and green innovation. This result shows that green culture is a factor that encourages green innovation in businesses. The adoption of green culture by businesses accelerates green innovation processes by encouraging employees to adopt environmentally friendly practices. These findings are consistent with the results obtained in previous studies and show that green innovation contributes to organizational sustainability.

The results of different studies on the effect between the concept of green culture and the concept of green innovation in the literature were analyzed and the effect size between the two concepts was revealed. The data regarding the relationship were evaluated by meta-analysis method. Six studies from the Web of Science, Google Scholar, Scopus, ProQuest and PubMed databases were included in the study. As a result of the meta-analysis, a relationship between green culture and green innovation with a value of 0.566 and medium strength was determined. With this effect, the  $H_0$  hypothesis of the study, that there is no relationship between the concepts of green culture and green innovation, is rejected. The  $H_1$  hypothesis of the study, that there is a significant relationship between green culture and green innovation, is accepted.



The limited number of studies conducted on the relationship between the concepts of “Green Culture” and “Green Innovation” can be considered a limitation of this study. Especially there are very few studies on the concept of green culture in organizations. In order to better understand sustainable organizations, to reveal their positive effects in social life, and to encourage green innovation, qualitative and quantitative emphasis should be placed on studies focusing on green culture. Generally, the studies on green innovation addressed concepts such as technology, finance, green business, green business performance and green human resources management. In the current study, the effect sizes and relationships between the less studied concepts of green culture and green innovation were examined. In the future, it is thought that revealing the effect size between the concept of green culture and the concept of green innovation using meta-analysis method will contribute to the literature. This study statistically reveals that green culture positively affects green innovation. It is seen that businesses that adopt green culture realize green innovation more. Organizations should increase employee awareness by investing in green culture training. Financial incentives supporting green innovation should be provided in line with sustainability policies. Future research should examine the mechanisms of green culture diffusion within organizations in more detail with qualitative data collection methods.

According to the research results, it has been observed that businesses that adopt green culture save energy, improve waste management and develop sustainable production processes. In addition, it has been determined that green innovation provides cost advantage to businesses and increases their competitiveness. In this context, it is recommended that businesses develop policies that encourage green innovation. Businesses should raise awareness by regularly providing green culture and sustainability training to their employees. Government support and incentives should be increased to encourage green innovation, and businesses should be provided with funds for their sustainable projects. Businesses should minimize their carbon footprint by adopting environmentally friendly technologies in their production processes. New business models that encourage green innovation should be created and the concept of a circular economy should be adopted. Green innovation processes should be accelerated by collaborating with universities and research centers. In conclusion, the positive relationship between green culture and green innovation plays an important role in businesses achieving their sustainability goals. Future research should include qualitative and quantitative studies to analyze this relationship in more detail. In addition, the effects of green innovation and green culture practices in different sectors should be examined comparatively.

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**Research Article**

**The Relationship Between Green Culture and Green Innovation In Organizations: A Meta-Analytic Review**

*İşletmelerde Yeşil Kültür ve Yeşil İnovasyon Arasındaki İlişki: Bir Meta-Analitik İnceleme*

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**Genişletilmiş Özet**

**Öz**

*Küresel ısınma ve değişen iklimin olumsuz etkileri sonucu tüketicilerin çevre odaklı tercihleri ile ortaya çıkan yeşil kültür, yeşil inovasyon yapabilen modern işletmeleri rekabette daha avantajlı hale getiriyor. Yeşil kültür ve yeşil inovasyon, işletmelerin sürdürülebilirlik hedeflerine hizmet ediyor. Bu nedenle yeşil inovasyon ve yeşil kültür kavramları işletmelerin dikkatini çeken iki önemli kavram olarak ortaya çıkmıştır. Yeşil inovasyon, ürün, hizmet ve üretim süreçlerinde çevre dostu yaklaşımları ifade etmektedir. Yeşil kültür ise çalışanların çevreye yönelik değer, inanç ve davranışlarını ifade etmektedir. Çalışmanın amacı, literatürde yer alan farklı akademik araştırmacıların sonuçlarını bir araya getirmek ve meta-analiz yöntemi ile işletmelerde yeşil kültür ve yeşil inovasyon arasındaki etki büyüklüğünü ortaya koymaktır. Çalışmaya dahil edilen çalışmalar arasında Web of Science, Google Scholar, Scopus, ProQuest, PubMed veri tabanlarından derlenen 6 eser çalışmaya dahil edilmiştir. Analiz sonucunda yeşil kültür ile yeşil inovasyon arasındaki ilişkide 0,566'lık orta düzeyde bir etki büyüklüğü bulunmuştur. İki kavram arasında pozitif bir ilişki vardır.*

**Anahtar Kelimeler:** İşletme, Yeşil Kültür, Yeşil İnovasyon, Meta-Analiz, Sürdürülebilirlik

**1. GİRİŞ**

Küresel sürdürülebilirlik sorunlarının çözümü için 2015 yılında “Birleşmiş Milletler Sürdürülebilir Kalkınma Hedefleri” ilan edilmiştir. 193 üye ülke tarafından kabul edilen 17 ana hedef 169 alt hedefin amacı 2030 yılına kadar dünyada yoksulluk, açlık, eşitsizlik, çevre ve iklim değişikliği gibi sorunlarla mücadele etmektir (Hawkes & Popkin, 2015). Bu hedeflerin on ikincisi sorumlu üretim ve tüketimdir. Üretim tarafında işletmeler doğal kaynakları verimli kullanarak yeşil üretim yapılması konusunda teşvik edilmektedir. Üretim süreçlerinde enerji verimliliği, işletmelere düşen küresel gıda atıklarının yarıya düşürülmesi, ürün ve hizmetlerin çevreye duyarlı hale getirilmesi işletmeler açısından bir sorumluluk olarak duyurulmuştur (Pauliukevičienė & Stankeviciene, 2022). Diğer taraftan küresel ısınma ve çevresel sorunlara karşı toplumlarda oluşan bilinçlenme müşteri tercihlerini de yeşil tüketim tercihleri olarak etkilemiştir (Sheth vd., 2011). Bir etki de işletmelerde çevreci üretim kapsamında ülkeler tarafından getirilen yasal düzenlemelerdir (Porter & Derry, 2012). Bu gelişmeler sonucu çevreci ve sürdürülebilirlik kavramları işletmelerin üretim süreçlerinde dikkate aldığı konular haline gelmiştir. Çevreci üretim konusunda insan kaynağına bilgi ve farkındalık sağlayan, atık yönetim sistemine sahip döngüsel ekonomi bağlamında faaliyet gösteren işletmelerde yeşil kültür ve yeşil inovasyon kavramları doğmuştur (Asif vd., 2011).

Yeşil kültür işletmelerde bulunan çalışanlar tarafından çevresel sürdürülebilirliği ve gerekliliklerini içselleştirmeleri sonucu oluşan kültürdür. Yeşil kültür aynı zamanda işletme stratejilerinin oluşturulmasında, iş yapış süreçlerinde çevreci kararların etkili olması demektir (Abbas & Khan, 2023). Yeşil inovasyon gelişen teknolojiler doğrultusunda çevre dostu ürün ve hizmetlerin ortaya konulmasını ifade etmektedir (Schiederig vd., 2012). Yaratıcı iş fikirlerinin uygulanarak işletmelere değer yaratması inovasyon ile mümkündür (Ortiz-Villajos & Sotoca, 2018). Küresel ısınma ve çevresel sorunların insanlık yaşamını tehdit etmesi ile işletmelere düşen sorumluluk yeşil inovasyona dayalı ürün ve hizmetler üretmek olmuştur (C. Chang & Chen, 2013). Örgütler çevresel hedeflere yeşil inovasyon ile ulaşmaktadır. Üretim süreçlerinde ekolojik ayak izini azaltabilmek amacı ile işletmeler tarafından yenilikler yapılmaktadır (Arıcı & Uysal, 2022).

Yapılan bu alıřmada yeřil kltr ve yeřil inovasyon kavramları arasındaki iliřkiye dair etki byklđ literatrde yer alan farklı alıřmaların sonuları incelenerek ortaya konulmuřtur. Toplanan veriler Jamovi-Major programı ile meta-analiz yntemi kullanılarak analiz edilmiřtir. Yapılan alıřmada kapsama alınan eserler arasında Web of Science, Google Scholar, Scopus, ProQuest, PubMed veri tabanları 6 eser arařtırmaya dhil edilmiřtir. Meta analiz sonucunda yeřil kltr ile yeřil inovasyon arasında 0,566 deđerinde ve orta gte bir iliřki tespit edilmiřtir. Bu bilgiler iřıđında yrtlen alıřma altı blmden oluřmaktadır. alıřmanın giriř kısmı birinci blm, ikinci kısmı kavramsal ereve oluřturmaktadır. nc blmde ama ve hipotezlerin geliřtirilmesi yer alırken drdnc blm arařtırmanın yntemidir. Beřinci blmde bulgular yer almaktadır. Son blm tartıřma ve sonu kısmıdır.

## 2. KAVRAMSAL EREVE

### 2.1. Yeřil Kltr

Srdrlebilirlik politikaları retim srelerine yn vererek iřletmeler ierisinde evre dostu yaklařımları dođurmuřtur (Dasawat & Sharma, 2023). Yeřil kltr, yeřil inovasyon ve yeřil finans gibi kavramlar bugn daha srdrlebilir bir toplumun temel kaynađı olarak grlmektedir (Agrawal vd., 2024). Bu srete kilit oyuncular olarak iřletmeler kresel yeřil hedeflere ulařma hususunda nemli bir rol oynamaktadır. Karbon ayak izinin azaltılması, enerji tasarrufu, geri dnřtrlebilir rnler bu yeřil hedeflerden bazılarıdır (Yuliantini vd., 2023). Srdrlebilir kalkınmanın nemli bir yn olarak grlen yeřil kltrde evresel deđerler rgtsel kltre dahil edilmektedir. Dođal evreye faydalı evre dostu rn ve hizmetlerin retilmesi yeřil kltrdeki bilinlenmeyi ifade etmektedir (Shahriari vd., 2023). evresel zararı en aza indirmek iin retim faaliyetlerinin ekolojik etkileri analiz edilerek izleme ve kontrol ařamaları gerekleřmektedir (Alkhodary, 2023).

### 2.2. Yeřil İnovasyon

Yeřil inovasyon evresel hedeflere ulařmada rn ve retim srelerinde yapılan yenilikler olarak ifade edilmektedir. İřletmelerde ekolojik ayak izini azaltma bu srecin en nemli kazanımlarındandır. Yeřil inovasyonun iřletmelere kazandırdıđı diđer kazanımlardan biri de kaynak verimliliđi sađlamasıdır. Enerji tketimi zerindeki tasarruf, atık geri dnřm maliyetlerde dřře neden olurken aynı zamanda evre zerindeki olumsuz etkileri azaltmaktadır (Begum vd., 2022; Yu vd., 2021; Wu vd., 2022).

## 3. YNTEM

Meta-analiz yntemi, birbirinden farklı birok arařtırmanın sonularını belirli bir konuda yapımıř arařtırma sonuları ile birleřtirmek sureti ile analiz ederek ortaya ıkan bulguların istatistiksel bir yntemidir. Yapılan bu alıřmada meta analiz yntemi kullanılarak daha nce elde edilen farklı arařtırmaların sonularını birleřtirmek sureti ile ıkarımlar yaparak iki kavram olan ‘‘Yeřil Kltr’’ ve ‘‘Yeřil İnovasyon’’ arasındaki etki byklđ ortaya konulması amalanmıřtır. Meta-analiz ynteminde kullanılan veriler daha nce yayımlanmıř alıřmaları ele alarak incelenmesi ve deđerlendirilmesini kapsamaktadır. Bu dođrultuda yapılan alıřmada ikincil verilerin kullanılması nedeni ile etik kurul izni gerekmemektedir. Yapılan arařtırmada kapsama alınan alıřmalar arasında Web of Science, Google Scholar, Scopus, ProQuest, PubMed veri tabanları 6 eser arařtırmaya dhil edilmiřtir. Seilen eserler Jamovi programı majr uzantısı ile istatistiksel olarak analiz edilmiřtir. Analizin yapılmasına ynelik korelasyon katsayısı ve rneklem byklđ verileri dikkate alınmıřtır.

## 4. BULGULAR

Yapılan alıřmaya dahil edilen arařtırmalar arasında Web of Science, Google Scholar, Scopus, ProQuest, PubMed veri tabanlarından derlenen 6 eser arařtırmaya dhil edilmiřtir. Meta analiz sonucunda yeřil kltr ile yeřil inovasyon kabiliyeti arasında 0,566 deđerinde ve orta gte bir iliřki tespit edilmiřtir. alıřmaya ait heterojenlik test ait sonucu tau : 0.287, tau<sup>2</sup>:0.0822, I<sup>2</sup> %96.34 tr. Gzlenen deđerler bazında Fisher r'den z'ye dnřtrlm korelasyon katsayıları 0.2661 ile 0.9730 arasında deđiřmektedir ve tahminlerin %100' pozitifdir. Rastgele etkiler modeline dayalı olarak tahmin edilen ortalama Fisher R'den Z'ye dnřtrlm korelasyon katsayısı  $\hat{\mu} = 0,5658$  (%95 GA: 0,3318 - 0,7998) olmuřtur. Bu nedenle, ortalama sonu sıfırdan nemli lde farklıdır. (Z = 4.7386, p < 0.0001). Q-testine gre reel sonuların heterojen olduđu grlmektedir (Q(5) = 140.6285, p < 0.0001, tau<sup>2</sup> = 0.0822, I<sup>2</sup> = 96.3415%). Reel sonular iin %95 tahmin aralıđı -0.0428 ile 1.1744 arasında verilmektedir. nceliklendirilmiř artıklar incelendiđinde, hibir alıřmanın  $\pm 2,6383$ 'ten byk bir deđere sahip olmadıđı ve dolayısıyla bu model bađlamında aykırı deđerlere iliřkin bir gsterge bulunmadıđı ortaya ıkmıřtır. p = 0.7194 ve p = 0.7494 olması yayın yanlılıđının olmadıđını gstermektedir.

## 5. TARTIŐMA VE SONUÇ

Bu araŐtırma yeŐil kltr ve yeŐil inovasyon arasındaki iliŐkileri literatrde yer alan farklı araŐtırmaların sonuçlarını bir araya getirerek iki kavram arasındaki etki byklđ ortaya koyulmuŐtur. İliŐkiye ait veriler meta-analiz yntemi ile deđerlendirilmiŐtir.

Yapılan araŐtırmada kapsama alınan eserler arasında Web of Science, Google Scholar, Scopus, ProQuest, PubMed veri tabanlarından 6 eser araŐtırmaya dhil edilmiŐtir. Meta analiz sonucunda yeŐil kltr ile yeŐil inovasyon arasında 0,566 deđerinde ve orta gçte bir iliŐki tespit edilmiŐtir.

Bu çalıŐmaya ait sınırlılıklar olarak iki kavram olan ‘‘YeŐil Kltr’’ ve ‘‘YeŐil İnovasyon’’ arasındaki iliŐkileri ele alan çalıŐmaların sınırlı olduđu grlmektedir. zellikle organizasyonlarda yeŐil kltr kavramı zerine yapılmıŐ çok az çalıŐmalar mevcuttur. Srdrlebilir organizasyonları daha iyi anlayabilmek, olumlu etkilerini toplumsal yaŐam ierisinde ortaya koyabilmek, yeŐil inovasyonu teŐvik edebilmek iin yeŐil kltr çalıŐmalarına nitel ve nicel anlamda ađırlık verilmelidir.