

ATILIM UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
DEPARTMENT OF BUSINESS ADMINISTRATION
BUSINESS ADMINISTRATION MASTER'S PROGRAMME

**IDENTIFY AND PRIORITIZING THE FACTORS AFFECTING
TELEWORKING DURING THE COVID-19 PANDEMIC**

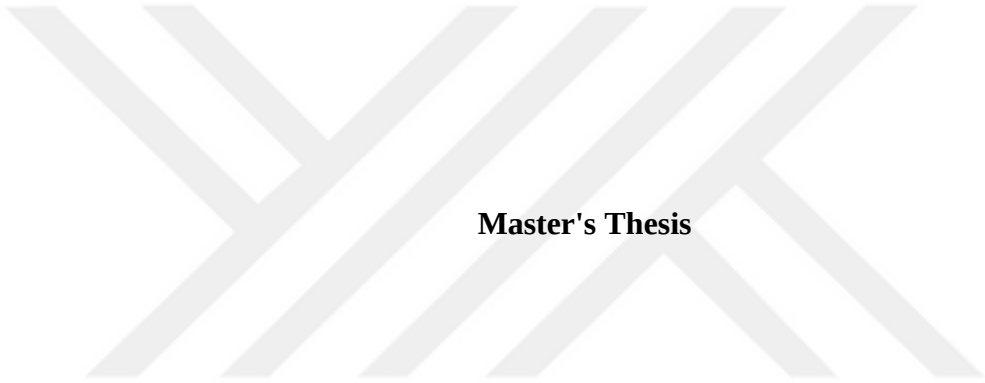
Master's Thesis

Samin MALEKİ

Ankara-2023

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Supervisor

Doç. Dr. Kemal Gürkan KÜÇÜKERGİN

Ankara-2023

ACCEPTANCE AND APPROVAL

This is to certify that this thesis titled “Identify and Prioritizing the Factors Affecting Teleworking During the COVID-19 Pandemic” and prepared by Samin Maleki meets with the committee’s approval unanimously as Master’s Thesis in the field of Business Administration following the successful defense of the thesis conducted on 02/10/2023.



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ETHICS DECLARATION

I accept and acknowledge that I have prepared this thesis study, prepared in line with the Thesis Writing Guidelines of Atilim University Graduate School of Social Sciences;

- within the framework of academic and ethical rules;
- presented the information, documents, evaluations, and results in a way that meets the rules of scientific ethics and morality,
- I have referenced each work from which I have benefited while preparing my thesis, and that
- I hereby present a unique study.

I hereby also understand that I shall accept any loss of rights against my behalf in cases otherwise.

2023/10/02

Samin MALEKİ

ÖZ

MALEKİ, Samin. COVID-19 Pandemisi Sırasında Uzaktan Çalışmayı Etkileyen Faktörleri Belirleme ve Önceliklendirme, Yüksek Lisans Tezi, Ankara, 2023.

Bu tezin amacı, COVID-19 pandemisi bağlamında Türk şirketlerinde uzaktan çalışmayı etkileyen faktörleri belirlemek ve önceliklendirmektir. Etkili faktörlerin belirlenmesi, literatür taraması ve araştırmanın teorik modelini oluşturmak için bulanık Delphi yönteminin uygulanması yoluyla gerçekleştirilmiştir. Bulgular, Türkiye'de özel firmalarda uzaktan çalışan 86 kişiden elde edilen bilgilerle analitik hiyerarşi süreci (AHP) yöntemi kullanılarak önceliklendirilmiştir. Sonuçlar, eğitim boyutunda eğitim kursları düzenleme, portal üzerinden eğitim ve personel uzmanlığını araştırmanın önemli olduğunu göstermiştir. Bireysel boyutta önemli faktörler arasında iş ahlakı, sorumluluk ve dürüstlük yer alırken, teknoloji bilgi ve iletişim altyapısı boyutunda yazılım altyapısı, bilgi altyapısı ve donanım altyapısının önemli olduğu görülmüştür. Son olarak, kültürel boyutun önemli faktörleri arasında insanlar arasında katılım kültürü geliştirmek, firma kültürü, çalışanları kabul etmeye hazır olmak ve yöneticilerin işleri başkalarına devretmeye hazır olmaları yer almaktadır.

Anahtar Sözcükler: AHP, Delphi, Faktörler, Pandemi, Türkiye, Uzaktan çalışma

ABSTRACT

MALEKİ, Samin. Identify and Prioritizing the Factors Affecting Teleworking During the COVID-19 Pandemic, Master's Thesis, Ankara, 2023.

The purpose of this thesis is to identify and prioritize factors affecting remote work in Turkish companies in the context of the COVID-19 pandemic. The identification of the effective factors was undertaken through a literature review and application of the fuzzy Delphi method to establish the theoretical model of the research. Findings were prioritized using the analytic hierarchy process (AHP) method with information obtained from 86 individuals who teleworked for private firms in Türkiye. The results showed that, in the dimension of training, holding training courses, training on portals, and investigating staff specialization are important. In the individual dimension, important factors include work conscience, responsibility, and honesty, while in the dimension of technology information and communication infrastructure, software infrastructure, information infrastructure, and hardware infrastructure are of importance. Finally, the important factors of the cultural dimension include developing a culture of participation between people, firm culture, readiness to accept employees, and readiness of managers to delegate affairs to others.

Keywords: AHP, Delphi, Factors, Pandemic, Teleworking, Türkiye

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INTRODUCTION

Main topic of research

The COVID-19 virus and the crisis caused by its spread seem to be reaching an end; however, what will remain for societies will be the significant experience of virtual management, interaction, and collaboration in the “remote work” system, which will usher in a new era in labor relations and define the duties of companies (Nguyen & Armoogum, 2021). Success in this field will be achieved by changing managers’ and employees’ mental and cultural attitudes and preparing the necessary infrastructure. Following the spread of the coronavirus, in many countries of the world “remote working” and advising employees to work at home in order to prevent the spread of illness and cut off the chain of viral transmission while not halting the activities of organizations was the only option of many governments and employers (Sudre et al., 2021).

The COVID-19 pandemic led to the creation of many problems, stress, and anxiety among most sections of society as a major human and economic crisis. At the same time, the employees of government organizations were also involved in many problems and challenges caused by the crisis of this virus. The spread of the COVID-19 virus, the crisis caused by it, and the measures taken to control it all changed the normal routines of people’s lives and caused many people to experience negative feelings such as anxiety and fear. With sudden changes and decisions to force employees to work from home, the separation of work and personal life became blurred. As a result of these imposed changes, the work efficiency and motivation of many employees decreased, and their mental health was affected by stress and negativity (Sardeshmukh et al., 2012).

Existing information about the advantages and disadvantages of telework was formed in a situation where telework was only sporadically practiced; its application in the particular circumstances of the COVID-19 pandemic can be questioned. (Wang & Deng, 2020). As previously mentioned, telecommuting during the COVID-19 pandemic presented unique challenges, including stress stemming from health and job uncertainty in the pandemic context, reduced access to childcare support due to the closure of schools and childcare facilities, experiences of social and professional

isolation, and conflicts between family and work responsibilities. (Carillo et al., 2020; Chang et al., 2021; Wang & Deng, 2020).

Problem statement and research question

In this thesis, by studying the relevant theoretical and empirical foundations, the critical factors of teleworking among organizations in Türkiye will be investigated. The aim of the study is to answer the following main research question:

“What are the critical factors for the success of the teleworking system in the event of a COVID-19 pandemic?”

The following sub-questions were formulated considering the aim of the study:

1. What are the factors affecting the teleworking system in the event of a COVID-19 pandemic?
2. What is the priority of the factors affecting the teleworking system in the event of a COVID-19 pandemic?

Objectives

The purpose of this thesis is to investigate and prioritize the factors of teleworking systems in the event of a COVID-19 pandemic. The research setting includes organizations and private firms, the commercial sector, and the governmental sector. These particular firms and sectors were chosen because they were affected by the COVID-19 pandemic. They are recognized as being high-budget private companies in Türkiye with good turnover and strong structures for teleworking. The main objectives of the research are as follows:

1. Investigating the factors affecting the teleworking system in the event of a COVID-19 pandemic.
2. Prioritizing the factors affecting the teleworking system in the event of a COVID-19 pandemic.
3. Proposing a conceptual model of the research on teleworking systems.

Structure of the thesis

As shown in Figure 1, in this thesis, first the concepts and theories related to remote work or teleworking are examined and the proposed models and factors

affecting remote work are analyzed. Subsequently, a set of indicators and factors is subdivided according to the main relevant dimensions. These are identified and prioritized using the hierarchical analysis process method; in other words, factors are determined using the standard pairwise comparison questionnaire of El-Saati (2001) with weighting and degrees of preference. This prioritization can serve as a basis for the adoption of favorable teleworking policies among Turkish companies under pandemic conditions (Belzunegui-Eraso & Erro-Garcés, 2020).

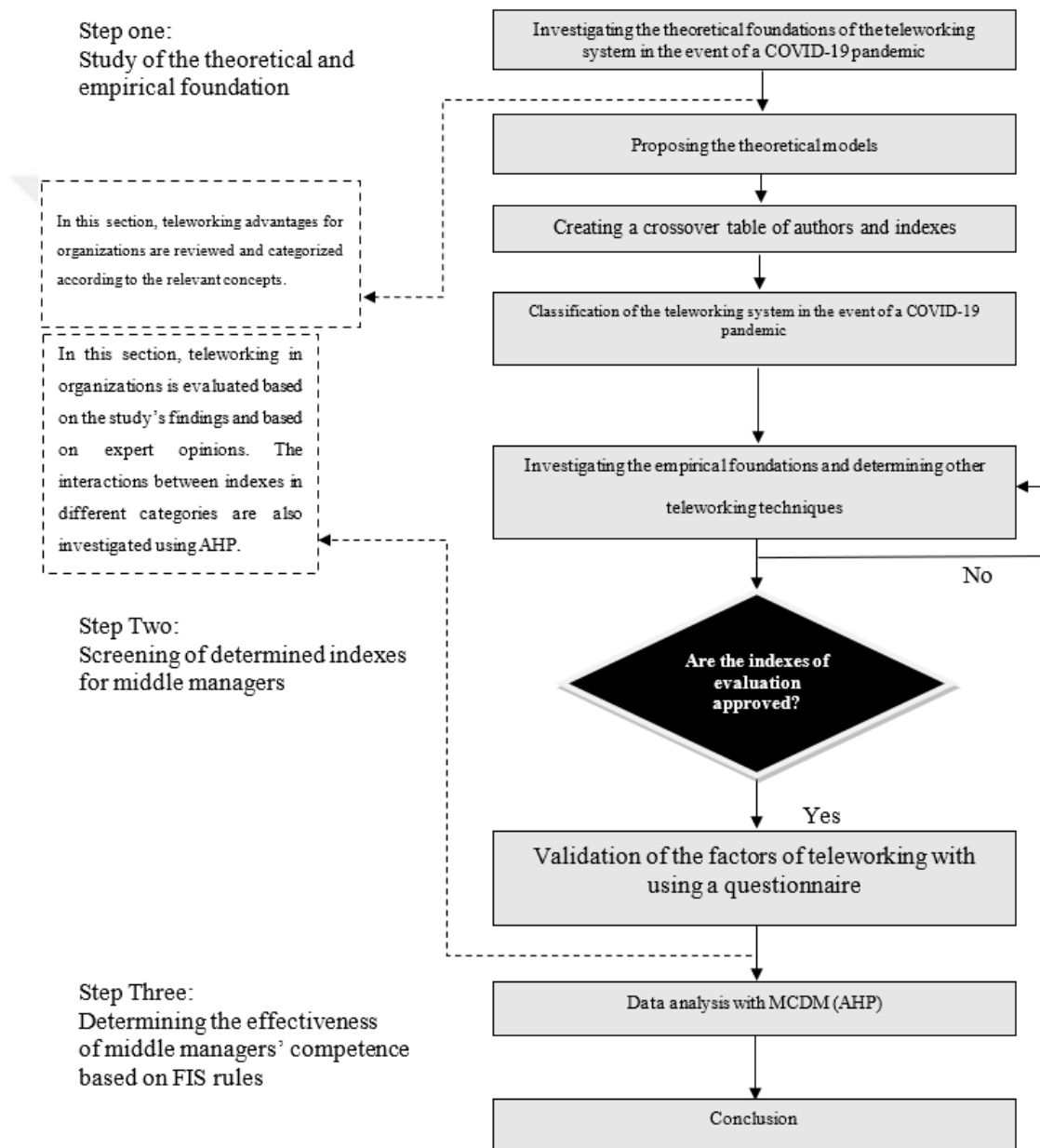


Figure 1: Implementation Stages of the Study

The structure of this study is presented in Figures 1-3 (van Zoonen, W., Sivunen, A., Blomqvist, K., Olsson, T., Ropponen, A., Henttonen, K., & Vartiainen, M. (2021)).

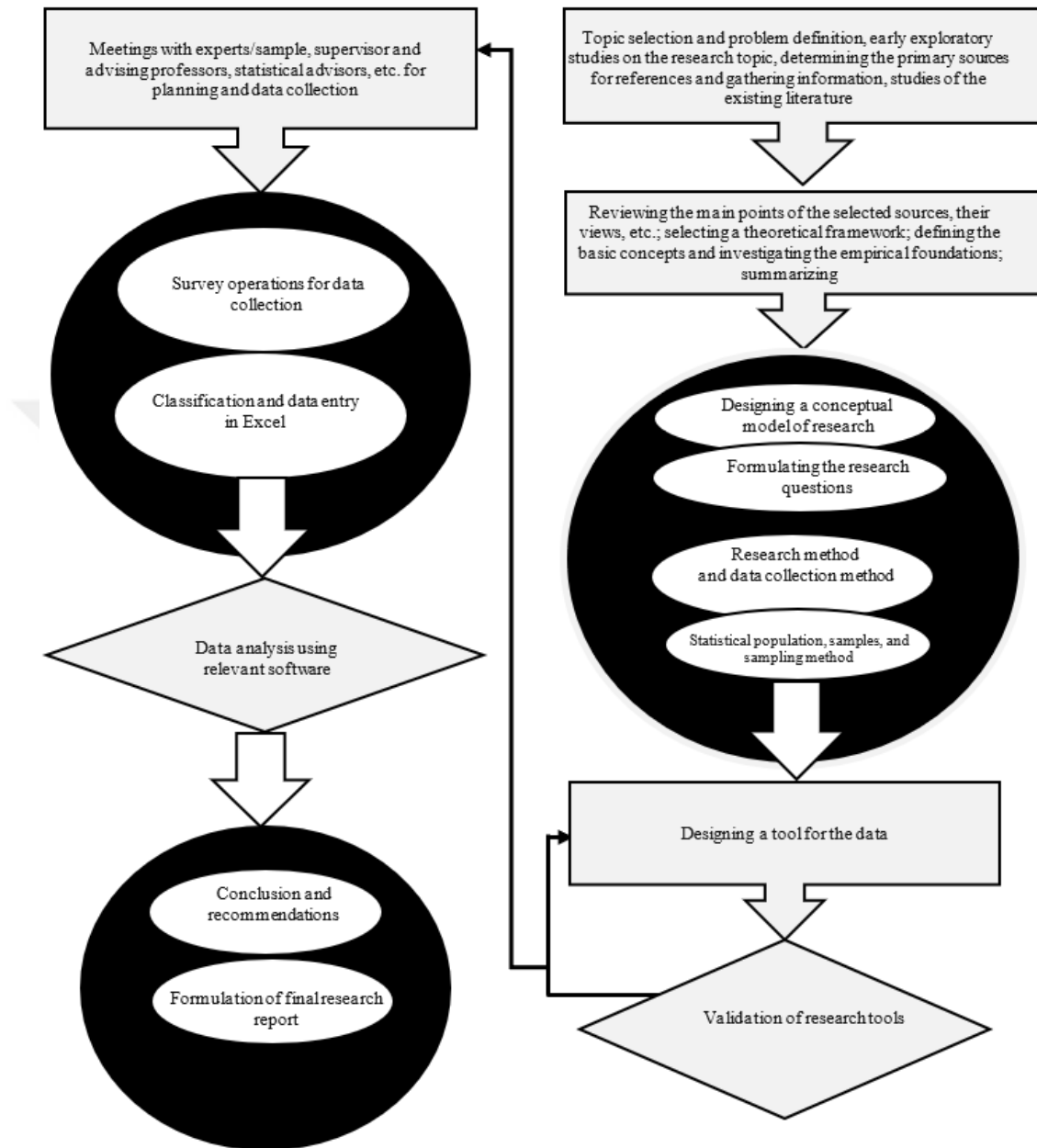


Figure 2: Project Structure of the Present Study

CHAPTER 1. LITERATURE REVIEW

1.1. Teleworking

For decades, some governments cultivated teleworking to reduce business travel and traffic management so that they could control peak travel times. However, with the spread of the coronavirus, teleworking became a mandatory activity for employees (Valentin, 2013). Various definitions and descriptions of teleworking have been suggested, each of which emphasizes specific aspects of this issue. For example, by one definition, teleworking is explained as a way of organizing work using information and communication technologies that enables managers and employees to carry out their job activities from changing places while leaving the traditional physical workplace (Perez et al., 2003). Teleworking can therefore be seen as an idea of conducting teleworking activities in whole or using information and communication technologies. Tracking and doing work at home, or teleworking at home, is used for employees who have their main place of work at home. In this way, in addition to the main administrative centers where work is done formally, other suitable branches and offices are considered for easier access to employees and customers (Perez et al., 2003). By this definition, unlike the two previously presented, there is no pre-designated place to work and people are constantly changing places. Therefore, they use communication technologies to communicate with their work centers. Banking vendors and investors can be cited as examples (Perez et al., 2003). Many professionals work for companies thousands of miles away from home, meaning that companies are not geographically limited to finding the best talent and can find the talent they want from larger pools.

1.2. History of Teleworking

The common opinion is that teleworking first emerged in the early 1970s with funding from US federal research as a strategy to address the social problems associated with home-work travel (Stiles, 2020). The first telecommunications research was conducted by an aerospace scientist and designer in the United States in the early 1970s. In the 1990s, teleworking once again emerged as a solution for reducing travel, balancing work and family life, and gaining other economic and social benefits in industrial and service companies. However, despite the fact that the number of telecommuters expanded considerably from the early 1990s onwards, some

opposition to teleworking still remained and it has not been as widely adopted in some countries (Perez et al., 2003). Perhaps one of the reasons for this resistance is that, despite the development of information and communication technologies that help expand mobile teleworking and virtual offices, organizations are concerned about some new costs of this type of work, such as costs related to information security. Unions are also sometimes focused on changes in working conditions, including workplace status, productivity, and job prospects, in teleworking (Eraso & Erro-Garcés, 2020).

On the other hand, one of the reasons for employees' resistance is that they are not familiar with the process and mechanisms of remote work, and this culture has not been institutionalized among employees at different organizational levels (Eraso & Erro-Garcés, 2020; Berkery et al., 2017).

1.3. Advantages and Challenges of Teleworking

Teleworking has brought benefits to employees, organizations, and communities, and it has been designed to overcome some organizational and individual challenges. The advantages of telecommuting include speeding up the process of implementing actions without wasting energy and time. In the social dimension, telecommuting can solve many urban challenges such as traffic (Berkery et al., 2017). Other advantages of teleworking for employees may include greater staff autonomy in managing work and employee flexibility to choose the time and location of their work (Wojcak et al., 2016), as well as providing more employment opportunities for women and the elderly (Kazkani, 2020).

Employees can benefit from teleworking by being more independent, being able to work flexible hours, and spending less time and money on transportation. Teleworking also allows employees to better organize their work time. Researchers found that teleworking increases employee productivity and this approach is often part of welfare programs provided by organizations for employees (Richard, 2012).

For organizations, teleworking also has advantages such as increasing motivation, flexibility, and access to specific demographic groups; higher productivity; reduced disorder; and improved organizational image. Additionally, teleworking provides more work opportunities for women and the disabled, helps save energy, and contributes to the protection of the environment (Austin et al., 2020).

Teleworking also has negative effects, and both staff and managers have been concerned about the potential negative effects of working away from headquarters. The main challenges faced by people in teleworking include the feeling of isolation from society, the inability to separate the border between work and life, problems of self-regulation, and the lack of professional support. The most important challenges or barriers to teleworking are problems of access to technology, the integration of teleworking with the company's strategies and organizational structure, and the control and motivation of telecommuters. The main purpose of using teleworking in organizations is to create real value for all members to facilitate living and working simultaneously (Silva et al., 2019). Although teleworking can provide opportunities for employees' remote communication (Vargo et al., 2020) and lead to the acceleration of activities in a systematic way using communication software systems through coordination and channelization in an integrated manner (Stiles, 2020), management difficulties regarding telecommuters, such as the high cost of equipment and security concerns, are some other organizational difficulties that remain important considerations (Buomprisco et al., 2021). Other challenges are cultural resistance and attitudes toward teleworking. Lack of recognition of the need for change, telecommuter coordination, teleworking program maintenance costs, and telecommuter control are also significant challenges (Vargo et al., 2020). Table 1 shows the advantages and disadvantages of teleworking.

Table 1: Advantages and Disadvantages of Teleworking (Filardi et al., 2020)

Disadvantages	Advantages
Need for organizational structural changes	Occupying less workspace
Equipment costs	Increased productivity
Possible mistakes in choosing a job	Reduced absenteeism
Employee motivation	Flexibility in working relationships
Organizational problems	Better customer service
Difficulty of teamwork	Possibility of goal-based management
Possibility of losing a job position	More staff independence
Difficulty of upgrades	Reduced staff working problems
Psychological problems	Reduction in costs

1.4. Critical Factors of Teleworking

Teleworking affects organizations, operations, organizational efficiency, and external stakeholders and aspects of employee life. Teleworking negatively affects the ability of employees to share knowledge. It can also be said that despite support for

explicit knowledge sharing in teleworking, it is not always possible to transfer tacit knowledge, and this is because the ability to share tacit knowledge only exists in face-to-face interactions and in face-to-face teleworking meetings (Vargo et al., 2020). One of the factors influencing the implementation of remote work is culture-building among employees, which is possible through the inspiration of managers and organizational leaders. Teleworking is emphasizing the flexibility in work methods made possible by working from any location. (Belzunegui-Eraso & Erro-Garcés, 2020). The COVID-19 pandemic had very deep effects on the field of information technology in organizations, such that the implementation of software systems could increase the efficiency of employees (Vargo et al., 2020).

1.5. Evaluating the Performance of Telecommuters and Teleworking Programs

Evaluating the performance of telecommuters is more challenging than assessing the performance of other employees. Nevertheless, it can be said that to solve this problem, organizations can use objective criteria to evaluate performance. They can also use goal-based management methods to evaluate the performance of telecommuters (Onyemaechi et al., 2018). Such an objective performance appraisal method gives telecommuters a clear understanding of job tasks and plans and facilitates appraisal performance for managers. Regarding the effects of teleworking on the ability of managers to supervise employees, it can be said that teleworking reduces the ability of managers to supervise employees and remote control is one of the main concerns of managers. The final step in teleworking is managing and evaluating the teleworking program (Vargo et al., 2020). For telecommuters, a monitoring system can be implemented for their work, with which it is clear how much work the telecommuter has received and completed in a specified number of teleworking days. By using such a method, it is possible to seriously monitor the work of telecommuters, and misconceptions about the challenges related to methods of monitoring the work of telecommuters will gradually disappear (Eraso & Erro-Garcés, 2020). Using various financial, social, and organizational indicators, it is possible to evaluate the performance of telecommuting in line with organizational goals, and such indicators can be applied to determine the level of optimality and desirability of telecommuting (Bajikova & Harnish, 2021).

1.6. Factors Affecting the Successful Implementation of Teleworking

Teleworking on a large scale has rarely been seen in the industrialized world. This important fact contradicts the optimistic predictions of some people that existing work methods would be quickly replaced by teleworking and the end of the age of business travel (Algers et al., 2001). The implementation of teleworking requires the identification of factors affecting its implementation so that the determination of appropriate performance indicators can allow processes of evaluating and identifying deviations from remote work.

1.6.1. Environmental factors

Environmental factors have played a pivotal role in the evolution of teleworking, along with the concurrent goal of reducing operational costs for companies. In the 1970s, a period marked by rising urbanization and increased industrial activity, novel approaches to work organization emerged with the primary objective of mitigating the environmental impact associated with commuting to traditional workplaces (Belzunegui, 2020). These pioneering initiatives were driven by a desire to curtail pollution and reduce the carbon footprint resulting from daily mobility (Belzunegui, 2020). In essence, the focus during that era revolved around minimizing the environmental ramifications of economic activities, and telecommuting practices, to some extent, contributed to the benefits of reduced commuting to physical workplaces (van Zoonen et al., 2021).

1.6.2. Technology information and communication infrastructure

The trends of technological changes and their effects on the economy and labor market have been faster than the changes in laws. For example, the speed of labor law changes in many countries has not always been commensurate with the needs of teleworkers (Wojcak et al., 2016).

1.6.3. Organizational factors

One of the key determinants of successful telework implementation is organizational support, as highlighted in prior research (Allen et al., 2015). Studies examining the concept of perceived organizational support have demonstrated that when organizations provide support, they fulfill employees' socioemotional needs, acknowledge their work contributions, and signal the availability of assistance when

required. This support significantly contributes to overall job satisfaction and enhances work performance (Rhoades & Eisenberger, 2002). The management of telecommuters requires special attention to methods of coordination, control, motivation, access, communication with non-telecommuters, and care to maintain a common organizational culture. In this way, the management style applied for telecommuters is different, and face-to-face communication and direct monitoring are more prone to building relationships based on mutual trust. This can be a barrier to teleworking because most managers are reluctant to change their traditional habits of coordination and control (Urbaniec et al., 2022).

1.6.4. Individual factors

It is essential to consider that effective telecommuting requires individuals to exhibit specific personality traits. Evaluating these traits in remote employees is not only possible through direct supervision but can also be facilitated by various tools, including online personality assessment tests. Therefore, it is advisable for managers to utilize such tests, which are easily accessible on the internet, to identify suitable telecommuting candidates. These candidates should ideally demonstrate professionalism, responsibility, dependability, honesty, and self-reliance, in addition to being adept team players with strong communication skills and reasonable proficiency in the technologies pertinent to telecommuting (Vargo et al., 2020).

1.6.5. Economic factors

The COVID-19 pandemic catalyzed a seismic shift towards teleworking, engendering profound economic ramifications.

Businesses invested extensively in their technology infrastructures, driving growth in the tech sector, while also realizing cost savings as remote work boosted productivity and reduced office-related expenses. However, the pandemic exacerbated income disparities, amplifying the digital divide and necessitating investments in broadband infrastructure.

1.6.6. Training factors

One of the important variables driving telework effectiveness has been recognized as effective technological training for teleworkers. (Kinsman, 1987; Webster & Martocchio, 1995; Raghuram, 1996; Donaldson & Weiss, 1988). It is

crucial for all participants in a telecommuting program to possess a fundamental grasp of computer and network applications. It is advisable to assess each participant's proficiency through an initial examination before program commencement. The results of this assessment can be utilized to identify individuals in need of additional training. Equally important is the participation of all telecommuters in periodic security awareness training, preferably conducted annually. These sessions enable continuous education on the latest security threats and corresponding mitigation strategies specific to the telecommuting environment (Richard, 2012).

1.6.7. Cultural factors

Several predictions can be inferred from the view that teleworking arrangements are connected to organizational cultures. It is possible to employ Quinn's (1988) competing values framework as a foundational tool for categorizing these cultures (Lamond et al., 1998).

Given the regular isolation of telecommuters from their managers and colleagues, maintaining frequent communication is imperative. This encompasses not only the ability to promptly respond to emails and return phone calls but also a proactive approach of asking questions and expressing commitment to the work. Effective communication with team members is particularly critical in situations where telecommuters are part of a project team, ensuring seamless collaboration on the assigned project (Richard, 2012). This can be ensured by:

- The ability of managers to facilitate equal opportunities for telecommuters,
- Increasing managers' support for telecommuters,
- The ability to evaluate and control telecommuters by managers allocating the necessary resources before teleworking,
- Training managers to support telecommuters,
- Specific duties of telecommuters,
- No ambiguity in tasks,
- Teleworking performance evaluation systems,
- Determining the necessary communication standards for telecommuters and creating connections between teleworking initiatives and the goals and mission of the organization,

- Selecting motivated and skilled employees for teleworking as well as providing training for them,
- Strong job skills and high levels of job knowledge,
- Employees volunteering for teleworking,
- Employees demonstrating high productivity,
- Employees being well organized with good time management skills,
- Employees being achievement-oriented with high standards for job performance.



Table 2: Factors Affecting Teleworking (Mohammadi et al., 2023)

No.	Influential factors	Subfactors	Reference	Description
1	Technology information and communication infrastructure	Hardware infrastructure	(Wojcak et al., 2016)	Refers to all computer equipment and human resources structures that lead to remote communication
2		Software infrastructure	(Bojovic & Benavides, 2020)	Refers to all software and systems that provide access to information and accelerate communication between employees in the organization
3		Information infrastructure	(Urbaniec et al., 2022)	Refers to information systems that provide information to managers and employees at different organizational levels at a given point in time and under different conditions
4		Security infrastructure	(Athanasiadou & Theriou, 2021)	Refers to related facilities and equipment to secure the information of the organization and employees
5	Organizational factors	Personnel skills	(Urbaniec et al., 2022)	Refers to the expertise and skill of employees in the organization to use mobile tools in remote work
6		Management and implementation mechanisms	(Urbaniec et al., 2022)	Refers to the requirements and instructions related to remote work
7		Organic structures	(Urbaniec et al., 2022)	Refers to agile and flat structures that lead to increased teamwork and group work in the organization
8		Having agile processes	(Urbaniec et al., 2022)	Refers to the design of agile organizational processes and structures
9		Guidelines and requirements	(Vargo et al., 2020)	Refers to a set of documents that are compiled as a guide for employees to perform remote work correctly
10		Strengthening the core team in the organization	(Dias et al., 2020)	Refers to actions that lead to increased centralization and the strengthening of the team leader
11	Cultural factors	Developing a culture of participation between people	(Athanasiadou & Theriou, 2021)	Refers to culture-building among employees in the organization for the purpose of remote work
12		Firm culture	(Valentin, 2013)	Refers to organizational values and principles that should be applied by employees
13		Readiness to accept employees	(Nurliawati & Akbar, 2021)	Refers to the level of preparation of employees that enables remote working conditions
14		Readiness of managers to delegate affairs to others	(Kazekami, 2022)	Refers to the readiness of managers to delegate some organizational powers
15	Economic factors	Estimating the cost and revenue of teleworking	(Urbaniec et al., 2022)	Refers to the evaluation and analysis of costs and income from remote work
16		Checking the efficiency of the plan	(Vargo et al., 2020)	Refers to examining the effectiveness and productivity created by remote work
17	Training factors	Holding training courses	(Vargo et al., 2020)	Refers to conducting training courses to perform remote work better
18		Training on portals	(Souza et al., 2022)	Refers to education and culture-building through the company's software systems
-19		Investigating staff specialization	(Athanasiadou & Theriou, 2021)	Refers to examining the level of expertise of employees and adapting remote working conditions to it
20	Environmental factors	Location of employees	(Athanasiadou & Theriou, 2021)	Refers to determining the geographical location of employees in the organization
21	Individual factors	Staff access to required facilities	(Urbaniec et al., 2022)	Refers to motivating employees to cooperate and synergize in the optimal performance of remote work
22		Sense of employee participation	(Urbaniec et al., 2022)	Refers to a sense of cooperation in the form of groups and work teams by employees
23		Work conscience	(Urbaniec et al., 2022)	Refers to the sense or consciousness of the moral goodness or blameworthiness of one's own conduct, intentions, or character together with a feeling of obligation to do right or be good
24		Honesty	(Vargo et al., 2020)	Refers to honesty and mutual trust in the organization among employees
25		Responsibility	(Vargo et al., 2020)	Refers to things that we have to do; with no responsibilities, we could do (or not do) whatever we wanted, but in the absence of duty, it is difficult, if not impossible, to find any real purpose for our actions

CHAPTER 2. METHODOLOGY

2.1. Design of the Study

The purpose of this study is to identify and prioritize the factors affecting teleworking during the COVID-19 pandemic among organizations in Türkiye. The research setting includes organizations and private firms overseeing construction projects or operating in different sectors including the construction sector, commercial sector, and marketing sector (especially in call centers). Data were collected between April 2023 and May 2023 by sending a questionnaire to experts as a link via Google Forms. Participants who were aged ≥ 20 years completed the questionnaire. The distributions of the variables of gender, age group, type of employment, and work experience were determined based on the survey outcomes. This study includes 7 criteria and 25 subcriteria. In the course of the research, the fuzzy Delphi method is used to determine the relevant issues affecting teleworking, including steps of expert selecting, investigating and determining the suggested options, defining linguistic variables, and fuzzification. In the second step, the analytic hierarchy process (AHP) is used to prioritize the factors affecting the teleworking system via modeling, preferential judgment, calculations of relative weights, and integration of relative weights.

2.2. Sample Size

2.2.1. Sample size for fuzzy Delphi

The Delphi method with fuzzy theory was used to calculate and announce opinions among different experts (Alnoor et al., 2021). A Google Form questionnaire was distributed to a purposive sample comprising experts from various geographical regions of Türkiye (Antonelli, 2022). The inclusion criteria for these experts were having at least a basic bachelor's degree and being a part of society that struggled with the effects of COVID-19. In line with the second criterion, among the selected experts, people from the following groups were needed: 1- managers of all sectors of industry who worked from home or HR managers; 2- concept specialists in teleworking; 3- university professors. According to these characteristics, 10 experts were selected, 6 of whom were university professors and the rest of whom were managers in private industry.

2.2.2. Sample size for AHP

The research population of this study included 86 experts with activity areas in teleworking and information technology in organizations that had all of these features or at least one of them to confirm the final influential factors and to determine the effects on the success of teleworking. In this research, demographic statistics of the population including the age range variable were defined, and in this particular step, three ranges of age were selected. The one with the highest frequency was then subsequently selected. The variable of gender was also considered here. The final statistical category considered for AHP was work experience, with six possible subgroups.

2.3. Questionnaire

The research questionnaire was developed after reviewing the literature and based on the AHP method in the form of pairwise comparisons (Vilhelmson & Thulin, 2016). This questionnaire included the seven basic dimensions of Technology Information & Communication, Infrastructure, Organizational Factors, Cultural Factors, Economic Factors, Training Factors, Environmental Factors, and Individual Factors in order to evaluate teleworking in organizations during the COVID-19 pandemic two-by-two from the point of view of preference. The general structure of the research questionnaire is shown in Table 3.

Table 3: Questionnaire Format

Construct	Question/Items	Description	Scale / Rating					No opinion
			Not at all important	Slightly important	Important	Fairly important	Very important	

2.4. Data Analysis

In this study, first of all, the criteria and factors affecting teleworking in organizations were identified by reviewing relevant articles and previous research, and then the factors were refined and divided into seven categories using the fuzzy Delphi method. Based on the methodology of the AHP, the factors in each category were prioritized according to the level of importance and experts' opinions in the form of a

Likert-type scale. In the following sections, the data analysis tools and methods are explained.

2.4.1. Fuzzy Delphi method

The fuzzy Delphi method was introduced by Kaufman and Gupta (1988) [Kaufmann, A., M. M. Gupta] and was also proposed by Ishikawa et al. (1993). Noorderhaven (1995) indicated that applying the fuzzy Delphi method to group decisions [Bellman, R. E., L. A. Zadeh] can solve the fuzziness [Klir, G. J., T. A. Folger] to establish a common understanding of expert opinions. Subsequently, the fuzzy numbers were derived utilizing the expert prediction interval value, culminating in the fuzzy Delphi method. Chen and Hsu (1996) [Hsu, H. M., C. T. Chen] proposed the fuzzy similarity aggregation method. Hence, the fuzzy Delphi method is a generalization of the classical method. It consists of the following steps [Kaufmann, A., M. M. Gupta, Hsu, H. M., C. T. Chen]:

- **Step 1** Experts are requested to offer potential occurrence dates for a specific event in the realms of science, technology, or business. These dates encompass the earliest conceivable moment, the most likely timeframe, and the latest conceivable point in time. The insights provided by these experts are then collated and submitted to a moderator for the purpose of performing fuzzy averaging in order to generate forecasts.
- **Step 2** The calculation of the average (mean) is carried out (Dubois, D., H. Prade) as discussed by Dubois and Prade. Subsequently, for each expert, the disparity between the mean and their specific data is calculated, which results in a triangular fuzzy number (Grzegorzewski, P). This deviation is subsequently conveyed to the experts for a reevaluation of their assessments.
- **Step 3** Each expert provides a fresh set of triangular numbers. Following this, the process recommences from Step 2, where the triangular averages are recalculated and subsequently replaced as appropriate. If needed, novel triangular numbers are generated and their averages are computed. This iterative procedure can be reiterated until two consecutive means exhibit reasonably close alignment. In Step 4, at a later point in time, the forecasting may undergo a reexamination.

- **Step 4** The forecasting may be reevaluated using the same methodology in the future, should significant information become accessible as a result of novel discoveries or any other form of misinterpretation.

2.4.2. Hierarchical analysis technique

Multi-criteria decision-making (MCDM) is a conceptual framework utilized to address intricate decision-making situations characterized by the presence of many competing criteria and the involvement of decision-makers with diverse preferences. Multiple Criteria Decision Making (MCDM) procedures involve the incorporation of a multitude of evaluation criteria, as opposed to relying solely on a single measure of optimality. The current MCDM models can be classified into two separate branches, namely multi-objective decision-making (MODM) and multi-attribute decision-making (MADM) (Tavana et al., 2021). The analytic hierarchy process (AHP), initially introduced by Saaty in 1980, stands out as one of the most well regarded approaches in the field of multiple criteria decision making (MCDM). The Analytic Hierarchy Process (AHP) provides a systematic and organized methodology for addressing intricate decision-making dilemmas by utilizing principles taken from the fields of mathematics and psychology (Tavana et al., 2021).

The AHP introduces a systematic and comprehensive framework for quantifying each constituent element within a hierarchical decision-making structure. This process commences with the selection of pertinent decision criteria, followed by the evaluation of alternatives based on these chosen criteria. The AHP's distinctive methodology hinges on conducting pairwise comparisons among decision criteria while adhering to the tenets of reciprocal conditions, homogeneity, dependency, and expectations. Through this rigorous process, the AHP systematically prioritizes each criterion (Tavana, 2004).

Saaty's seminal work in 1980 highlighted numerous advantages associated with the AHP, including its ability to provide a unified model for problem-solving, its analytical and systematic approach to addressing intricate issues, and its unique power for tackling the interplay of criteria. Additionally, the AHP upholds the observance of hierarchical structures in decision-making, excels in quantifying intangible and qualitative scenarios, examines the consistency of priority assignments, synthesizes desirability among alternatives, facilitates trade-offs based on preferences, and

promotes sound judgment, consensus-building, and the prospect of refinement through repetition.

These notable advantages have driven the widespread adoption of the AHP across various domains spanning business, science, healthcare, and education.

In essence, the AHP empowers decision-makers to establish priorities based on their objectives, knowledge, and experience while taking into account their subjective perspectives and judgments. The AHP algorithm is defined as follows (Tavana, 2006):

Step 1. Construct a hierarchical structure. The decision problem is first delineated by identifying the primary criteria and alternatives. Subsequently, the problem is further segmented into levels of purpose, criteria, subcriteria, and alternatives. The hierarchical structure is characterized by the interdependence of each element on its respective higher-level element, with this interdependence extending linearly to the uppermost level. Moreover, it is necessary to do the evaluation procedure anew anytime alterations occur in the hierarchical framework (Tavana et al., 2021).

Step 2. Create a pairwise evaluation matrix wherein the elements within each level are compared in pairs, resulting in the generation of paired comparison matrices. To gauge the matter and preference in these pairwise comparisons, a 9-point scale is employed. At this stage, it is crucial that preferences adhere to the reciprocity and homogeneity conditions. For a comprehensive understanding of how individual judgments are aggregated in group AHP and the formal method for combining judgments into a common matrix, please refer to the work of (Amenta et al. 2020).

Step 3. Determine the inconsistency rate. In light of the fact that pairwise comparison matrices derived from expert judgments may at times be inconsistent, an experimental rate has been developed to evaluate the consistency of the hierarchical structure as well as the judgments. If inconsistencies are discovered in the judgments, the outcomes will be reassessed by the experts (Tavana et al., 2021).

CHAPTER 3. RESULTS AND DISCUSSION

3.1. Analysis of the Collected Data

To analyze the data, the identification and finalization of the teleworking criteria is first done using the fuzzy Delphi method. Subsequently, using the AHP method, the criteria are weighted separately according to the pertinent dimensions.

3.2. Discussion of the Obtained Results

3.2.1. Fuzzy Delphi method

The nature of the problem and its solution is such that achieving objective results requires the cooperation of experts. Therefore, in this research, the fuzzy Delphi method is used to determine the issues affecting teleworking. The core of this research to determine the factors affecting teleworking through application of the fuzzy Delphi method was established based on a review of the literature. After that, the operational steps of the fuzzy Delphi method were undertaken as follows:

Step 1. Expert selection

Experts must first be selected and justified. Some key characteristics for selecting experts are as follows: they must be involved with the subject, have continuing information about the issue, and have an incentive to take part in the Delphi process., and feel that the information gained from group agreement will be valuable to them. Due to the large scale of the problem, several organizations are interested in figuring out this issue. As a result, experts were chosen in such a way that they would be good advocates of the stakeholders as much as possible. (Talebi et al. 2022). The main experts in this case are industry owners, senior managers and industry employees, specialists, related professors in universities, and representatives of relevant associations. Other necessary characteristics of the selected experts are having a comprehensive attitude and reflecting different dimensions of expertise and positions towards teleworking. Therefore, among the selected experts, people from the following groups needed to be represented: 1- managers of all sectors of industry who worked from home or HR managers; 2- concept specialists on teleworking; 3- university professors. According to the mentioned characteristics, 10 experts were finally selected, 6 of whom were university professors while the rest were managers

of the construction industry. These experts helped with the early planning for the research's implementation.

Step 2. Investigating and determining the suggested options

The goal of this stage was to discover the boundaries of effective elements in teleworking. Several studies have been undertaken in this area. According to these factors, a questionnaire was created to gather expert opinions on the effects of these factors, as well as their ineffectiveness and impact on performance. However, due to the ambiguity of the considered concepts, the questionnaire was designed based on fuzzy variables, which are discussed below.

Step 3. Define linguistic variables

As mentioned above, the questionnaire was designed to obtain expert opinions about the relationship between the proposed items and teleworking factors and the extent of their impact on it. Linguistic variables were determined as variables whose values are words or sentences in a natural or artificial language (i.e., languages that emerge in computer simulations, robot interactions, and so on). Since several factors are involved in the questions and answers, using variables with definite values would make it difficult for experts to comment (Bellman & Zadeh, 1970). For this reason, it is clear that qualitative variables give experts more freedom of action. The use of qualitative variables such as low, medium, high, etc. largely solves the above problems but creates another problem. People's mentalities towards qualitative variables such as "more" or "less" are not the same. Different characteristics of people affect qualitative variables; for example, some people have a strict attitude, while others are easygoing, while some people are optimistic while others are gloomy (Klir & Folger, 1988). As a result, analyzing variables caused by different mindsets and interpretations would be useless. As a result, the experts answer the questions with the same mindset by specifying the range of qualitative characteristics.

Step 4. Fuzzification

In this stage, the verbal variables are fuzzy. For fuzzy variables, a range of five Likert-type options with equal distances is used. The fuzzy number equivalent to each of the verbal variables is shown in Table 4.

Table 4: The Fuzzy Number Equivalent to Each of the Verbal Variables

Triangular fuzzy number	Verbal variables
(0.75,1,1)	Very high
(0.5,0.75,1)	High
(0.25,0.5,0.75)	Moderate
(0,0.25,0.5)	Low
(0,0,0.25)	Very low

First stage of the fuzzy Delphi survey

Based on the review of the literature and the opinions expressed by experts, 25 factors affecting the organization of teleworking were suggested. According to the proposed options and linguistic variables defined in Section 3, a questionnaire was designed to be presented to experts (Appendix). The results of examining the answers to the first stage of the survey questionnaire are given in Table 5. As can be seen, no new suggestions were received in addition to the initially offered options.

Table 5: Results of Counting the Answers of the First Stage of the Survey

Factors	Agreement rate				
	Very high	High	Moderate	Low	Very low
Hardware infrastructure	4	4	1	0	1
Software infrastructure	4	4	1	0	1
Information infrastructure	4	2	0	2	0
Security infrastructure	4	4	2	2	0
Personnel skills	4	4	2	2	0
Management and implementation mechanisms	3	3	4	3	0
Organic structures	3	3	3	2	1
Having agile processes	5	4	2	1	0
Guidelines and requirements	4	1	2	6	0
Strengthening the core team in the organization	4	4	2	2	0
Developing a culture of participation between people	4	4	2	2	0
Firm culture	3	2	4	3	0
Readiness to accept employees	3	2	1	2	0
Readiness of managers to delegate affairs to others	1	3	3	4	0
Estimating the cost and revenue of teleworking	2	4	3	2	0
Checking the efficiency of the plan	4	1	4	2	0
Holding training courses	4	4	1	0	1
Training on portals	4	2	0	2	0
Investigating staff specialization	4	4	2	2	0
Location of employees	4	4	2	2	0
Staff access to required facilities	3	3	4	3	0
Sense of employee participation	3	3	3	2	1
Work conscience	5	4	2	1	0
Honesty	4	1	2	6	0
Responsibility	4	4	1	0	1

To obtain the fuzzy mean as well as the mean defuzzification based on the results in Table 5, the method introduced by Bajikova is used (Bajikova, 2019). Tables 6 and 7 present the fuzzy mean and mean defuzzification methods, respectively.

Table 6: How to Obtain a Fuzzy Mean

Fuzzy number	Fuzzy average
$(m_a^1, m_m^1, m_\beta^1)$ $(m_a^2, m_m^2, m_\beta^2)$ $\vdots$ $(m_a^n, m_m^n, m_\beta^n)$	$\text{Fuzzy average} = \left(\frac{ma1+ma2+\dots+man}{n}, \frac{mm1+mm2+\dots+mmn}{n}, \frac{m\beta1+m\beta2+\dots+m\beta n}{n} \right)$

Defuzzification

$$X_{\max}^1 = \frac{ma+mm+m\beta}{3}$$

$$X_{\max}^2 = \frac{ma+2mm+m\beta}{4}$$

$$X_{\max}^3 = \frac{ma+4mm+m\beta}{6}$$

$$\text{crisp number} = Z^* = \max \{x_{\max}^1, x_{\max}^2, x_{\max}^3\}$$

Table 7 summarizes the results of the calculations using the above formulas.

Table 7: Average Views of Experts From the First Survey

No	Factors	Fuzzy average	Average after defuzzification
1	Hardware infrastructure	(0.5,0.75,0.90)	0.74
2	Software infrastructure	(0.53,0.75,0.90)	0.74
3	Information infrastructure	(0.50,0.75,0.88)	0.73
4	Security infrastructure	(0.46,0.71,0.88)	0.70
5	Personnel skills	(0.46,0.71,0.88)	0.70
6	Management and implementation mechanisms	(0.37,0.62,0.83)	0.61
7	Organic structures	(0.37,0.60,0.79)	0.59
8	Having agile processes	(0.52,0.77,0.92)	0.75
9	Guidelines and requirements	(0.31,0.56,0.73)	0.55
10	Strengthening the core team in the organization	(0.46,0.71,0.88)	0.70
11	Developing a culture of participation between people	(0.46,0.71,0.88)	0.70
12	Firm culture	(0.35,0.60,0.59)	0.59
13	Readiness to accept employees	(0.44,0.69,0.84)	0.67
14	Readiness of managers to delegate affairs to others	(0.27,0.52,0.75)	0.52
15	Estimating the cost and revenue of teleworking	(0.37,0.64,0.84)	0.63
16	Checking the efficiency of the plan	(0.41,0.66,0.82)	0.65
17	Holding training courses	(0.53,0.75,0.90)	0.74
18	Training on portals	(0.50,0.75,0.88)	0.73
-19	Investigating staff specialization	(0.46,0.71,0.88)	0.70
20	Location of employee	(0.46,0.71,0.88)	0.70
21	Staff access to required facilities	(0.37,0.62,0.83)	0.61
22	Sense of employee participation	(0.37,0.60,0.79)	0.59
23	Work conscience	(0.52,0.77,0.92)	0.75
24	Honesty	(0.31,0.56,0.73)	0.55
25	Responsibility	(0.46,0.71,0.88)	0.70

The definite means obtained in Table 7 show the intensity of experts' agreement with each of the components of the conceptual model of the research.

Second stage of the survey

In the second stage, a questionnaire was prepared. In this questionnaire, the suggested options along with each person's previous point of view and the extent of their differences with the views of other experts (defuzzified average) were sent again to the members of the expert group. Table 8 provides an example of how to poll at this stage.

Table 8: Sample Questionnaire Sent to Experts in the Second Stage

No	Factors	Total average, previous stage's experts' opinions	Previous comment	Agreement rate				
				Very high	High	Moderate	Low	Very low
1	Hardware infrastructure	0.74	0.75					
2	Software infrastructure	0.74	0.75					
3	Information infrastructure	0.73	0.75					
4	Security infrastructure	0.70	0.75					
5	Personnel skills	0.70	0.25					
6	Management and implementation mechanisms	0.61	0.10					
7	Organic structures	0.59	----					
8	Having agile processes	0.75	0.50					
9	Guidelines and requirements	0.55	0.50					
10	Strengthening the core team in the organization	0.7	0.50					
11	Developing a culture of participation between people	0.7	0.50					
12	Firm culture	0.59	0.100					
13	Readiness to accept employees	0.67	0.25					
14	Readiness of managers to delegate affairs to others	0.52	---					
15	Estimating the cost and revenue of teleworking	0.63	0.75					
16	Checking the efficiency of the plan	0.56	0.25					
17	Holding training courses	0.74	0.75					
18	Training on portals	0.73	0.75					
19	Investigating staff specialization	0.70	0.75					
20	Location of employees	0.70	0.25					
21	Staff access to required facilities	0.61	0.10					
22	Sense of employee participation	0.59	0.51					
23	Work conscience	0.75	0.50					
24	Honesty	0.55	0.50					
25	Responsibility	0.7	0.50					

In the second stage, the members of the expert group answered the questions again according to the points of view of the other members of the group. Table 8 is given accordingly.

According to the views presented in the first stage and its comparison with the results of this stage, if the difference between the two stages was less than the threshold and thus very small (0.1), then the polling process stopped (Cheng & Lin, 2002). According to Formula 4.1, the difference between the first and second steps can be calculated (Table 9).

$$s(A_{m2}, A_{m1}) = \left[\frac{1}{3} [(a_{m21} + a_{m22} + a_{m23}) - (a_{m11} + a_{m12} + a_{m13})] \right] \quad \text{Formula (4.1)}$$

Table 9: Difference Between the Views of Experts in the First and Second Round

Factors	Round 1	Round 2	Difference between the first and second round
Hardware infrastructure	0.74	0.79	0.05
Software infrastructure	0.74	0.79	0.05
Information infrastructure	0.73	0.77	0.04
Security infrastructure	0.70	0.70	0
Personnel skills	0.70	0.70	0
Management and implementation mechanisms	0.61	0.65	0.04
Organic structures	0.59	0.58	-0.01
Having agile processes	0.75	0.81	0.06
Guidelines and requirements	0.55	0.37	-0.018
Strengthening the core team in the organization	0.7	0.76	0.06
Developing a culture of participation between people	0.7	0.76	0.06
Firm culture	0.59	0.62	0.03
Readiness to accept employees	0.67	0.43	-0.24
Readiness of managers to delegate affairs to others	0.52	0.55	0.03
Estimating the cost and revenue of teleworking	0.63	0.64	0.01
Checking the efficiency of the plan	0.65	0.67	0.02
Holding training courses	0.74	0.79	0.05
Training on portals	0.73	0.77	0.04
Investigating staff specialization	0.70	0.70	0
Location of employees	0.70	0.70	0
Staff access to required facilities	0.61	0.65	0.04
Sense of employee participation	0.59	0.58	-0.01
Work conscience	0.75	0.81	0.06
Honesty	0.55	0.37	-0.018
Responsibility	0.7	0.76	0.06

Third round

According to the views presented in the first stage and their comparison with the results of the second stage, if the difference between the two stages was less than the threshold and thus very small (0.1), then the poll process stopped (Cheng & Lin, 2002).

Based on the results obtained from the fuzzy Delphi method, the factors affecting the organization of teleworking were finalized. Using these factors and based on the literature review presented in the second chapter, with the help of experts, the conceptual model of factors affecting teleworking was developed.

Prioritizing the factors affecting teleworking systems using the AHP

Applying the AHP method requires the following four main steps:

1. Modeling: Designing a hierarchical structural model of the research.
2. Preferential judgment: Performing pairwise comparisons and determining the priority of the answers.
3. Calculations of relative weights: Determining the weights of the importance of the indicators.
4. Integration of relative weights: Ranking and prioritization of indicators by dimensions.

Step 1. In the modeling in this research, the purpose of hierarchical decision-making is to weigh the factors affecting teleworking systems in the construction industry. The hierarchical structure of the problem is shown in Figure 3.

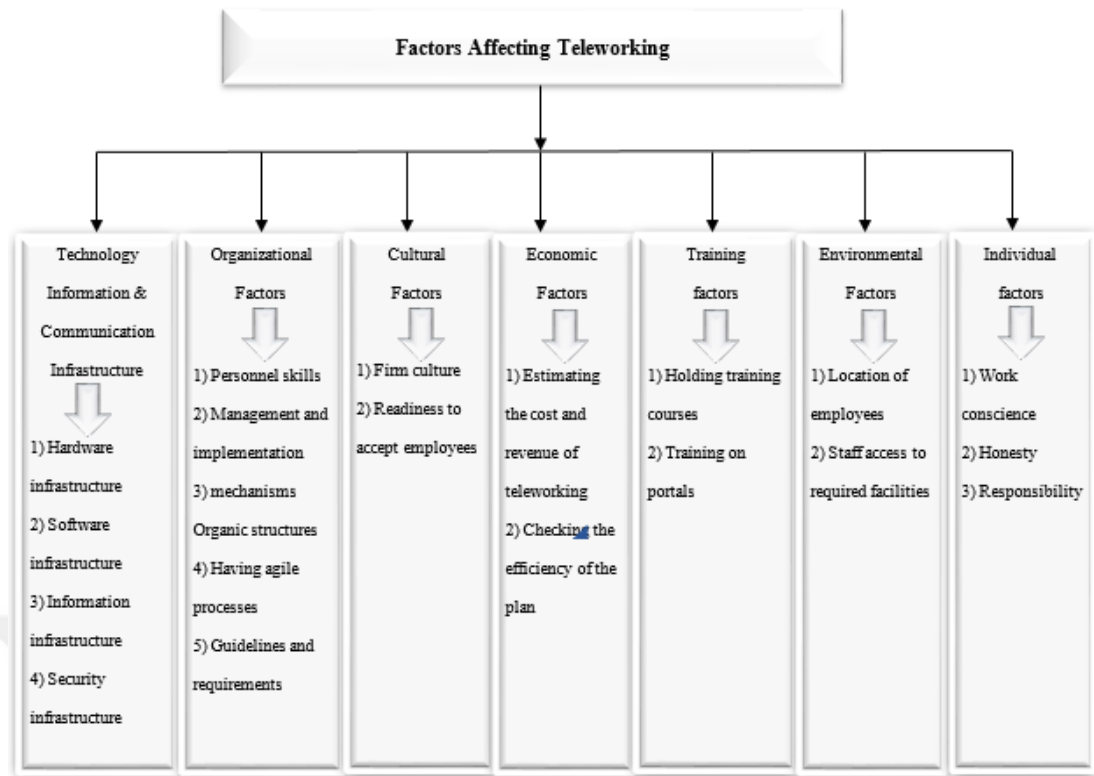


Figure 3: Hierarchical Structure of the Problem

3.3. Demographic Statistics of the Study

3.3.1. Age range variable

According to Table 10, the distribution rate of the statistical sample of the research is as follows: in the age range of 20 to 30 years, there are 20 people, equal to 24%; in the age range of 31 to 40 years, there are 36 people, equal to 41%; and in the age range of 40 to 50 years, there are 30 people, equal to 35%. Thus, the highest percentage of participants were in the age range of 31 to 40 years.

Table 10: Distribution of Descriptive Statistics in Terms of Age Range

Age	Number	Percent
20-30	20	24
31-40	36	41
41-50	30	35
Total	86	100

3.3.2. Gender variable

According to Table 11, the distribution rate of the statistical sample of the research in terms of gender entailed 70 men, equal to 81%, and 16 women, equal to 19%. Thus, the highest percentage of participants were men.

Table 11: Distribution of Descriptive Statistics in Terms of Gender

Gender	Number	Percent
Men	70	81
Women	16	19
Total	86	100

3.3.3. Work experience variable

According to Table 12, the distribution rate of the statistical sample in terms of work experience was as follows: the number of people with less than 5 years of experience was 9, equal to 10%; the number of people with experience between 5 and 10 years was 10, equal to 11%; the number of people with experience between 11 and 15 years was 20, equal to 23%; the number of people with experience between 16 and 20 years was 17, equal to 20%; the number of people with experience between 21 and 25 years was 11, equal to 13%; and the number of people with more than 25 years of experience was 19, equal to 23%. Thus, the highest percentage of participants had a work history of either 11-15 years or more than 25 years.

Table 12: Distribution of Descriptive Statistics in Terms of Work Experience

Work experience	Number	Percent
1-5	9	10
6-10	10	11
11-15	20	23
16-20	17	20
21-25	11	13
26-30	19	23
Total	86	100

Step Two. Preferential judgment is applied in this stage, first by performing pairwise comparisons between indicators, comparing their importance or preference with each other, and forming a geometric matrix of pairwise comparisons of indicators, and then examining pairwise comparisons between each of the identification factors.

Table 13: Matrix of Pairwise Comparisons of Technology Information and Communication Infrastructure

Technology information & communication infrastructure	Hardware infrastructure	Software infrastructure	Information infrastructure	Security infrastructure
Hardware infrastructure	1	1/7	1/3	1/5
Software infrastructure	7	1	1/3	1/7
Information infrastructure	3	3	1	1/3
Security infrastructure	5	7	3	1

Table 14: Matrix of Pairwise Comparisons of Training Factors

Training factors	Holding training courses	Training on portals	Investigating staff specialization
Holding training courses	1	1/7	5
Training on portals	7	1	1/5
Investigating staff specialization	1/5	5	1

Table 15: Matrix of Pairwise Comparisons of Organizational Factors

Organizational factors	Personnel skills	Management and implementation mechanisms	Organic structures	Having agile processes	Guidelines and requirements
Personnel skills	1	3	1/7	1/5	3
Management and implementation mechanisms	1/3	1	1/5	7	1/7
Organic structures	7	5	1	1/5	3
Having agile processes	5	1/7	5	1	7
Guidelines and requirements	1/3	7	1/3	1/7	1

Table 16: Matrix of Pairwise Comparisons of Cultural Factors

Cultural factors	Developing a culture of participation between people	Firm culture	Readiness to accept employees	Readiness of managers to delegate affairs to others
Developing a culture of participation between people	1	5	1/3	1/7
Firm culture	1/5	1	1/3	1/5
Readiness to accept employees	3	3	1	5
Readiness of managers to delegate affairs to others	7	5	1/5	1

Table 17: Matrix of Pairwise Comparisons of Economics Factors

Economic factors	Estimating the cost and revenue of teleworking	Checking the efficiency of the plan
Estimating the cost and revenue of teleworking	1	5
Checking the efficiency of the plan	1/5	1

Table 18: Matrix of Pairwise Comparisons of Environmental Factors

Environmental factors	Personnel skills	Management and implementation mechanisms	Organic structures	Having agile processes	Guidelines and requirements
Personnel skills	1	3	1/7	1/5	3
Management and implementation mechanisms	1/3	1	1/5	7	1/7
Organic structures	7	5	1	1/5	3
Having agile processes	5	1/7	5	1	7
Guidelines and requirements	1/3	7	1/3	1/7	1

Table 19: Matrix of Pairwise Comparisons of Individual Factors

Individual factors	Work conscience	Honesty	Responsibility
Work conscience	1	5	3
Honesty	1/5	1	1/7
Responsibility	1/3	7	1

Normalized pairwise comparison matrix and final weight

Next, we calculate the total of the values in each column of the pairwise comparison matrix and divide each column element by the sum of the numbers in that column using the AHP steps. The resulting new matrix is known as the "normalized comparison matrix." The average of the integers in each row of the normalized comparison matrix is computed. This shows the decision elements' relative weight in relation to the matrix rows. This procedure is demonstrated by entering the information from the pairwise comparison matrix received from the statistical sample's average answers into Expert Choice software in the following dimensions:

Prioritizing the criteria of training factors

According to the results of Expert Choice software and as shown in Table 20, among the training factors, "Holding training courses" has a priority score of 0.567,

“Training on portals” has a score of 0.237 points, and “Investigating staff specialization” has a score of 0.091.

Table 20: Ranking of Training Factors in Teleworking

Factors	Score	Rank
Holding training courses	0.567	1
Training on portals	0.237	2
Investigating staff specialization	0.149	3

Prioritizing the criteria of individual factors

According to the results obtained from Expert Choice software and as seen in Table 21, among the individual factors, “Work conscience” has a priority score of 0.590, “Honesty” has a score of 0.20, and “Responsibility” has a score of 0.167.

Table 21: Ranking Of individual Factors in Teleworking

Factors	Score	Rank
Work conscience	0.590	1
Honesty	0.20	2
Responsibility	0.167	3

Prioritizing the criteria of technology information and communication infrastructure factors

According to the results obtained from Expert Choice software and as seen in Table 22, among the technology information and communication infrastructure factors, “Security infrastructure” has a priority score of 0.76, “Managerial approach” has a score of 0.28, “Software infrastructure” has a score of 0.22, and “Information infrastructure” has a score of 0.1.

Table 22: Ranking of Technology Information and Communication Infrastructure factors in Teleworking

Factors	Score	Rank
Security infrastructure	0.76	1
Software infrastructure	0.28	2
Information infrastructure	0.1	3
Hardware infrastructure	0.1	4

Prioritizing the criteria of cultural factors

According to the results obtained from Expert Choice software and as seen in Table 23, among the cultural factors, “Developing a culture of participation between people” has a priority score of 0.439, “Firm culture” has a score of 0.24, “Firm culture” has a score of 0.2, and “Readiness to accept employees” has a score of 0.11.

Table 23: Ranking of Cultural Factors in Teleworking

Factors	Score	Rank
Developing a culture of participation between people	0.439	1
Firm culture	0.24	2
Readiness to accept employees	0.11	3
Readiness of managers to delegate affairs to others	0.09	4

Prioritizing the criteria of organizational factors

According to the results obtained from Expert Choice software and as seen in Table 24, among the organizational factors, “Management and implementation mechanisms” has a priority score of 0.328, “Organic structure” has a score of 0.236, “Having agile processes” has a score of 0.171, and “Personnel skills” has a score of 0.12.

Table 24: Ranking of Organizational Factors in Teleworking

Factors	Score	Rank
Management and implementation mechanisms	0.328	1
Organic structure	0.236	2
Having agile processes	0.171	3
Personnel skills	0.12	4

Prioritizing the criteria of economic factors

According to the results obtained from Expert Choice software and as shown in Table 25, among the economic factors, “Estimating the cost and revenue of telecommuting” has a priority score of 0.565 and “Checking the efficiency of the plan” has a score of 0.435.

Table 25: Ranking of Economic Factors in Teleworking

Factors	Score	Rank
Estimating the cost and revenue of teleworking	0.565	1
Checking the efficiency of the plan	0.435	2

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study has focused on employees who work from home and were influenced by the effects of the pandemic, and the purpose of the study was to investigate the factors that may affect each level of an organization in terms of teleworking. The findings of this study may help organizations identify which factors are most important to investigate and thus obtain good results for telecommuters.

The research findings indicate that, in the category of technology information and communication infrastructure, factors include “Security infrastructure,” “Hardware infrastructure,” “Software infrastructure,” and “Information infrastructure.” Security infrastructure was revealed to have an important role in the implementation of teleworking in these companies. These findings are contrary to those of previous studies (Belzunegui-Eraso & Erro-Garcés, 2020), as it was previously stated that a majority of organizations had already implemented teleworking strategies. Consequently, organizations were already obligated to furnish their workforces with technological resources for remote work, encompassing not only hardware but also specialized software, such as remote apps. As an illustration of this scenario, universities have provided telematics tools to professors in order to enhance the feasibility of remote teaching. These tools supplement the conventional software that was already accessible for facilitating communication between educators and students (Belzunegui-Eraso & Erro-Garcés, 2020).

Employees who telework may lack information on organizational actions, leading to incorrect interpretations and insufficient opportunities for verification. Organizations have ongoing, informal activities that employees must participate in to fully comprehend and interpret their roles. Informal communication with coworkers at lunch or in their offices might reduce misunderstandings. In telework, these opportunities are eliminated (Wojcak et al., 2016). These findings are in parallel with the results of the present study illustrating that in the field of organizational factors, “Developing a culture of participation between people,” “Human resources,” “Firm culture,” and “Readiness to accept employees” are of importance.

The results of this study also revealed that “Holding training courses” had the top priority among training factors. “Training on portals” and “Investigating staff

specialization” also influenced teleworking. These findings are in parallel with previous studies reporting that it is critical that all staff members taking part in a telecommuting program understand the fundamentals of using computers and networks. Before such a program begins, it is advisable to conduct a competence assessment of each prospective participant. The examination results can subsequently be used to identify users who require more training. It is also imperative that all remote workers participate in a security awareness training course, ideally once a year. With the help of such evaluations and training, staff members will be able to stay up to date on the most recent security risks and the appropriate defenses that apply to remote work environments (Ye, 2012).

Moreover, it was revealed that individual factors have positive and significant impacts on the implementation of teleworking. Among the individual factors, “Work conscience” ranked highest in terms of priority, followed by “Honesty” and “Responsibility.” This result is supported by the findings of Onyemaechi et al. (2018), who stated that telecommuting allows more flexibility in employees’ schedules, which helps them respond quickly in case of unexpected events.

Managerial implications

This research provides a comprehensive understanding of the factors influencing teleworking during the COVID-19 pandemic. By identifying and prioritizing these factors, it sheds light on the key determinants that impact the successful implementation and sustainability of telework arrangements.

In the context of strategic decision-making, organizations can benefit from the prioritized factors by incorporating them into their strategic decision-making processes. This study has revealed that security infrastructure is of superlative importance for safeguarding organizations’ data in the course of teleworking. As the results showed for the factors of technology information and communication infrastructure, “Security infrastructure” had the highest score among all other factors. This indicates that firms should prioritize the investigation of security infrastructure.

Effective communication between employees to advance organizational aims has always been the most important challenge for HR managers (Mutuku, 2014). Monitoring employees during teleworking has proven to be challenging. While it was initially assumed in this study that employees’ readiness to adapt to new conditions

would be most important, the results demonstrated that developing a culture of participation among employees was more valuable than the other considered factors.

Teleworking is not a new issue, but increasing the scale and number of remote employees creates problems, especially in large organizations. In remote workforce management, providing employees with the necessary guidance to perform tasks or checking the work paths of teams is a serious challenge. Fortunately, there are tools such as Slack, Zoom, Trello, and Microsoft Teams that can help manage remote workforces. The important point is that managers should test and evaluate all these tools in order to have the possibility of choosing the best option that suits their work styles and needs. Managers should not be afraid to replace these tools; if they think another tool may be more helpful, they should reevaluate the situation and change their tools.

A growing number of companies have embraced teleworking, incorporating distinct provisions for it within their corporate collective agreements and strategies. However, these provisions traditionally envision telework as a solution catering to individual home and family requirements or organizational demands. Notably, there is a lack of collective agreements that preemptively address scenarios involving widespread telecommuting or the adoption of teleworking during security or health crises. This observation holds true across companies of varying sizes (Belzunegui, 2020).

Limitations of the study

Geographic Scope: This study focused on organizations in Türkiye. While Türkiye was not the only country grappling with the challenges of COVID-19, the findings may not be directly generalizable to other countries.

Organizational Diversity: This research addressed a relatively broad spectrum of organizations. However, specific types of organizations, such as governmental entities or universities, may exhibit unique dynamics and responses to teleworking that were not extensively explored in this study.

Factors Under Investigation: The study delved into seven main types of factors, including training, culture, and individual aspects, among others, within

organizations. Nevertheless, other various facets of teleworking exist, which could be explored in subsequent research endeavors.



REFERENCES

- Allen, T. D., Golden, T. D., & Shockley, K. M. (2015). How effective is telecommuting? Assessing the status of our scientific findings. *Psychological Science in the Public Interest*, 16(2), 40-68. <https://doi.org/10.1177/1529100615593273>
- Alnoor, A., Abdullah, H. O., AL-Abrow, H., Wah Khaw, K., Al-Awidi, I. A., Abbas, S., & Omrane, A. (2022). A Fuzzy Delphi analytic job demands-resources model to rank factors influencing open innovation. *Transnational Corporations Review*, 14(2), 178-192. <https://doi.org/10.1080/19186444.2021.1956854>
- Antonelli, M., Basile, L., Gagliardi, F., & Isernia, P. (2022). The future of the Mediterranean agri-food systems: Trends and perspectives from a Delphi survey. *Land Use Policy*, 120, 106263. <https://doi.org/10.1016/j.landusepol.2022.106263>
- Athanasiadou, C., & Theriou, G. (2021). Telework: systematic literature review and future research agenda. *Heliyon*, 7(10), e08165. <https://doi.org/10.1016/j.heliyon.2021.e08165>
- Austin-Egole, I. S., Iheriohanma, E. B., & Nwokorie, C. (2020). Flexible working arrangements and organizational performance: An overview. *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*, 25(5), 50-59. <https://doi.org/10.9790/0837-2505065059>
- Bellman, R. E., & Zadeh, L. A. (1970). Decision-making in a fuzzy environment. *Management science*, 17(4), 141-164. <https://doi.org/10.1287/mnsc.17.4.B141>
- Belzunegui-Eraso, A., & Erro-Garcés, A. (2020). Teleworking in the Context of the Covid-19 Crisis. *Sustainability*, 12(9), 3662. <https://doi.org/10.3390/su12093662>
- Belzunegui-Eraso, A., & Erro-Garcés, A. (2020). Teleworking in the Context of the Covid-19 Crisis. *Sustainability*, 12(9), 3662. <https://doi.org/10.3390/su12093662>

- Berkery, E., Morley, M. J., Tiernan, S., Purtill, H., & Parry, E. (2017). On the uptake of flexible working arrangements and the association with human resource and organizational performance outcomes. *European Management Review*, 14(2), 165-183. <https://doi.org/10.1111/emre.12103>
- Buomprisco, G., Ricci, S., Perri, R., & De Sio, S. (2021). Health and telework: New challenges after COVID-19 pandemic. *European Journal of Environment and Public Health*, 5(2), 73-77. <https://doi.org/10.21601/ejeph/9705>
- Chaiyaphan, C., & Ransikarbum, K. (2020). Criteria analysis of food safety using the Analytic Hierarchy Process (AHP)-a case study of Thailand's fresh markets. E3S Web of Conferences. *EDP Sciences*, 141, 2001 <https://doi.org/10.1051/e3sconf/202014102001>
- Dubois, D., & Prade, H. (1987). The mean value of a fuzzy number. *Fuzzy Sets and Systems*, 24(3), 279-300. [https://doi.org/10.1016/0165-0114\(87\)90028-5](https://doi.org/10.1016/0165-0114(87)90028-5)
- Filardi, F., Castro, R. M. P., & Zanini, M. T. F. (2020). Advantages and disadvantages of teleworking in Brazilian public administration: analysis of SERPRO and Federal Revenue experiences. *Cadernos EBAPE. BR*, 18(1), 28-46. <https://doi.org/10.1590/1679-395174605x>
- Grzegorzewski, P. (1998). Metrics and orders in space of fuzzy numbers. *Fuzzy Sets and Systems*, 97(1), 83-94. [https://doi.org/10.1016/S0165-0114\(96\)00322-3](https://doi.org/10.1016/S0165-0114(96)00322-3)
- Hsu, H. M., & Chen, C. T. (1996). Aggregation of fuzzy opinions under group decision making. *Fuzzy Sets and Systems*, 79(3), 279-285. [https://doi.org/10.1016/0165-0114\(95\)00185-9](https://doi.org/10.1016/0165-0114(95)00185-9)
- Irwin, F. (2004). Gaining the air quality and climate benefit for telework. *Environmental Protection Agency and the AT&T Foundation*, <http://pdf.wri.org/teleworkguide.pdf> [20.06. 2021].
- Ishizaka, A., & Labib, A. (2011). Selection of new production facilities with the group analytic hierarchy process ordering method. *Expert Systems with Applications*, 38(6), 7317-7325. <https://doi.org/10.1016/j.eswa.2010.12.004>
- Kaufmann, A., & Gupta, M. M. (1988). *Fuzzy mathematical models in engineering and management science*. New York: Elsevier Science Inc.

- Kazmi, R., Amjad, S., & Khan, D. (2008). Occupational stress and its effect on job performance. A case study of medical house officers of district Abbottabad. *Journal of Ayub Medical College Abbottabad*, 20(3), 135-139.
- Klir, G. J., & Folger, T. A. (1988). *Fuzzy sets, uncertainty, and information*. New Jersey: Prentice-Hall, Inc.
- Lamond, D. A., Standen, P., & Daniels, K. (1998). Contexts, cultures and forms of teleworking. Griffin, G. (Ed.) *Management Theory and Practice: Moving to A New Era*. Melbourne: Macmillan.
- Lister, K., & Harnish, T. (2019). Telework and its effects in the United States. Messenger J.C. (Ed.) *Telework in the 21st Century*. Cheltenham: Edward Elger Publishing Inc., 29, 128-170.
- Mahmudova, S., & Jabrailova, Z. (2020). Development of an algorithm using the AHP method for selecting software according to its functionality. *Soft Computing*, 24(11), 8495-8502. <https://doi.org/10.1007/s00500-020-04902-y>
- Mohammadi, M., Rahimi, E., Davatgari, A., Javadinasr, M., Mohammadian, A., Bhagat-Conway, M. W., & Khoeini, S. (2023). Examining the persistence of telecommuting after the COVID-19 pandemic. *Transportation Letters*, 15(6), 608-621. <https://doi.org/10.1080/19427867.2022.2077582>
- Mutuku, C. K. & Mathooko, P. (2014). Effects of organizational communication on employee motivation: A case study of Nokia Siemens Networks Kenya. *International Academic Journal of Information Sciences and Project Management*, 1(3), 28-62
- Nguyen, M. H., & Armoogum, J. (2021). Perception and preference for home-based telework in the covid-19 era: A gender-based analysis in Hanoi, Vietnam. *Sustainability*, 13(6), 3179. <https://doi.org/10.3390/su13063179>
- Onyemaechi, U., Chinyere, U. P., & Emmanuel, U. (2018). Impact of telecommuting on employees' performance. *Journal of Economics and Management Sciences*, 1(3), 54. <https://doi.org/10.30560/jems.v1n3p54>
- Perez, M. P., Sanchez, A. M., & De Luis Carnicer, M. P. (2003). Top manager and institutional effects on the adoption of innovations: The case of teleworking 1. *Prometheus*, 21(1), 58-73. <https://doi.org/10.1080/0810902032000051018>

- Picu, C. G., & Dinu, A. (2016). Research on the current telecommuting trends in United States and european union markets. *Management and Economics Review*, 1(2), 194-202.
- Rahman, K. T., & Zahir Uddin Arif, M. (2021). Working from home during the COVID-19 pandemic: Satisfaction, challenges, and productivity of employees. *International Journal of Trade and Commerce-IIARTC*, 9(2), 282-294. <https://doi.org/10.46333/ijtc/9/2/3>
- Rhoades, L., & Eisenberger, R. (2002). Perceived organizational support: a review of the literature. *Journal of Applied Psychology*, 87(4), 698-714. <https://doi.org/10.1037/0021-9010.87.4.698>
- Sardeshmukh, S. R., Sharma, D., & Golden, T. D. (2012). Impact of telework on exhaustion and job engagement: A job demands and job resources model. *New Technology, Work and Employment*, 27(3), 193-207. <https://doi.org/10.1111/j.1468-005x.2012.00284.x>
- Souza, K. R., Melo, A. T. T., & Mira, E. P. (2022). Basic education in emergency contexts: what does research say about the reality of COVID-19?. *Revista Tempos e Espaços em Educação*, 15(34). <https://doi.org/10.20952/revtee.v15i34.17925>
- Stiles, J. (2020). Strategic niche management in transition pathways: Telework advocacy as groundwork for an incremental transformation. *Environmental Innovation and Societal Transitions*, 34, 139-150. <https://doi.org/10.1016/j.eist.2019.12.001>
- Sudre, C. H., Murray, B., Varsavsky, T., Graham, M. S., Penfold, R. S., Bowyer, R. C., & Steves, C. J. (2021). Attributes and predictors of long COVID. *Nature Medicine*, 27(4), 626-631. <https://doi.org/10.1038/s41591-021-01292-y>
- Talebi, M., Lari Dashtbayaz, M., & Nakhaei, H. (2022). Ranking of indices affecting operational budgeting based on performance information in the country's municipalities using the AHP method. *International Journal of Nonlinear Analysis and Applications*, 13(2), 2781-2794. <https://doi.org/10.22075/ijnaa.2021.23758.2596>

- Tavana, M. (2004). A subjective assessment of alternative mission architectures for the human exploration of Mars at NASA using multicriteria decision making. *Computers & Operations Research*, 31(7), 1147-1164. [https://doi.org/10.1016/S0305-0548\(03\)00074-1](https://doi.org/10.1016/S0305-0548(03)00074-1)
- Tavana, M., Soltanifar, M., & Santos-Arteaga, F. J. (2021). Analytical hierarchy process: Revolution and evolution. *Annals of Operations Research*, 326(2), 879-907. <https://doi.org/10.1007/s10479-021-04432-2>
- Turkeş, M. C., Stăncioiu, A. F., & Băltescu, C. A. (2021). Telework during the Covid-19 pandemic—an approach from the perspective of Romanian enterprises. *Amfiteatru Economic*, 23(58), 700-717.
- Urbaniec, M., Małkowska, A., & Włodarkiewicz-Klimek, H. (2022). The impact of technological developments on remote working: insights from the polish managers' perspective. *Sustainability*, 14(1), 552. <https://doi.org/10.3390/su14010552>
- Valentin, C. M. (2013). Experimental approach of the relationship between self-efficacy awareness and the tendency of self-improvement. *Procedia-Social and Behavioral Sciences*, 78, 541-545. <https://doi.org/10.1016/j.sbspro.2013.04.347>
- van Zoonen, W., Sivunen, A., Blomqvist, K., Olsson, T., Ropponen, A., Henttonen, K., & Vartiainen, M. (2021). Factors influencing adjustment to remote work: Employees' initial responses to the COVID-19 pandemic. *International Journal of Environmental Research and Public Health*, 18(13), 6966. <https://doi.org/10.3390/ijerph18136966>
- Vargo, D., Zhu, L., Benwell, B., & Yan, Z. (2020). Digital technology use during COVID-19 pandemic: A rapid review. *Human Behavior and Emerging Technologies*, 3(1), 13-24. <https://doi.org/10.1002/hbe2.242>
- Vilhelmson, B., & Thulin, E. (2016). Who and where are the flexible workers? Exploring the current diffusion of telework in Sweden. *New Technology, Work and Employment*, 31(1), 77-96. <https://doi.org/10.1111/ntwe.12060>

- Wang, J., & Deng, X. (2020). Comprehensive economic benefit evaluation method of coastal enterprises based on AHP. *Journal of Coastal Research*, 103(1), 24-28. <https://doi.org/10.2112/si103-006.1>
- Watterson, A. (2020). COVID-19 in the UK and occupational health and safety: predictable not inevitable failures by government, and trade union and nongovernmental organization responses. *New Solutions: A Journal of Environmental and Occupational Health Policy*, 30(2), 86-94. <https://doi.org/10.1177/1048291120929763>
- Wojcak, E., Bajzikova, L., Sajgalikova, H., & Polakova, M. (2016). How to achieve sustainable efficiency with teleworkers: Leadership model in telework. *Procedia-Social and Behavioral Sciences*, 229, 33-41. <https://doi.org/10.1016/j.sbspro.2016.07.111>
- Ye, L. R. (2012). Telecommuting: Implementation for success. *International Journal of Business and Social Science*, 3(15), 20-29.

APPENDIX 1: RESEARCH QUESTIONNAIRE

Construct	Question/Items	Description	Scale / Rating					
			Not at all important	Slightly important	Important	Fairly important	Very important	
Factors affecting teleworking	Please rate the following statements with regards to your organization:							
	Technology Information & Communication Infrastructure Factors	How important is Hardware infrastructure?	Refers to all computer equipment and human resources structures that lead to remote communication					
		How important is Software infrastructure?	Refers to all software and systems that provide access to information and accelerate communication between employees in the organization					
		How important is Information infrastructure?	Refers to information systems that provide information to managers and employees at different organizational levels at a given point in time and under different conditions					
		How important is Security infrastructure?	Refers to related facilities and equipment to secure the information of the organization and employees					
	Organizational Factors	How important is Personnel skills?	Refers to the expertise and skill of employees in the organization to use mobile tools in remote work					
		How important is Management and implementation mechanisms?	Refers to the requirements and instructions related to remote work					
		How important is Organic structures?	Refers to agile and flat structures that lead to increased teamwork and group work in the organization					
		How important is Having agile processes?	Refers to the design of agile organizational processes and structures					
		How important is Guidelines and requirements?	Refers to a set of documents that are compiled as a guide for employees to perform remote work correctly					
		How important is Strengthening the core team in the organization?	Refers to actions that lead to increased centralization and the strengthening of the team leader.					
	Cultural Factors	How important is Developing a culture of participation between people?	Refers to culture-building among employees in the organization for the purpose of remote work					
		How important is Firm culture?	Refers to organizational values and principles that should be applied by employees					

		How important is Readiness to accept employees?	Refers to the level of preparation of employees that enables remote working conditions					
		How important is Readiness of managers to delegate affairs to others?	Refers to the readiness of managers to delegate some organizational powers					
	Economic Factors	How important is Estimating the cost and revenue of teleworking?	Refers to the evaluation and analysis of costs and income from remote work					
		How important is Checking the efficiency of the plan?	Refers to examining the effectiveness and productivity created by remote work					
	Training Factors	How important is Holding training courses?	Refers to conducting training courses to perform remote work better					
		How important is Training on portals?	Refers to education and culture-building through the company's software systems.					
		How important is Investigating staff specialization?	Refers to examining the level of expertise of employees and adapting remote working conditions to it					
	Environmental Factors	How important is Location of employees?	Refers to determining the geographical location of employees in the organization					
		How important is Staff access to required facilities?	Refers to motivating employees to cooperate and synergize in the optimal performance of remote work					
	Individual Factors	How important is Sense of employee participation?	Refers to a sense of cooperation in the form of groups and work teams by employees					
		How important is Work conscience?	Refers to the sense or consciousness of the moral goodness or blameworthiness of one's own conduct, intentions, or character together with a feeling of obligation to do right or be good					
		How important is Honesty?	Refers to honesty and mutual trust in the organization among employees					
		How important is Responsibility?	Refers to things that we have to do; with no responsibilities, we could do (or not do) whatever we wanted, but in the absence of duty, it is difficult, if not impossible, to find any real purpose for our actions					

TURNITIN REPORT

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criteria", International Journal of Energy
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19	Submitted to SRH Holding Öğrenci Ödevi	<% 1
20	Submitted to University of Moratuwa Öğrenci Ödevi	<% 1
21	meral.edu.mm İnternet Kaynağı	<% 1
22	Ali Asghar Sadabadi, Zohreh Rahimi Rad, Kiarash Fartash. "Comprehensive evaluation of Iranian regional innovation system (RIS) performance using analytic hierarchy process (AHP)", Journal of Science and Technology Policy Management, 2021 Yayın	<% 1
23	Kou, Gang, Daji Ergu, and Yu Shi. "An integrated expert system for fast disaster assessment", Computers & Operations Research, 2012. Yayın	<% 1

24	bmjopen.bmj.com İnternet Kaynağı	<% 1
25	Submitted to University of College Cork Öğrenci Ödevi	<% 1
26	researchonline.jcu.edu.au İnternet Kaynağı	<% 1
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28	Mehdi Soltanifar, Hamid Sharafi, Farhad Hosseinzadeh Lotfi, Witold Pedrycz, Tofigh Allahviranloo. "Preferential Voting and Applications: Approaches Based on Data Envelopment Analysis", Springer Science and Business Media LLC, 2023 Yayın	<% 1
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31	d.lib.msu.edu İnternet Kaynağı	<% 1
32	catalog.libraries.psu.edu İnternet Kaynağı	<% 1
33	V.M. Bier. "Is fuzzy set theory more general than probability theory?", [1990] Proceedings	<% 1

First International Symposium on Uncertainty Modeling and Analysis, 1991

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36	jeasweb.org İnternet Kaynağı	<% 1
37	C.-R. Wu. "Analysing alternatives in financial services for wealth management banks: the analytic network process and the balanced scorecard approach", IMA Journal of Management Mathematics, 05/27/2009 Yayın	<% 1
38	Peter Karácsony. "Impact of teleworking on job satisfaction among Slovakian employees in the era of COVID-19", Problems and Perspectives in Management, 2021 Yayın	<% 1
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42	Chang, Y.H.. "Using ANP priorities with goal programming for revitalization strategies in historic transport: A case study of the Alishan Forest Railway", Expert Systems With Applications, 200905 Yayın	<% 1
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44	inzeko.ktu.lt İnternet Kaynağı	<% 1
45	opus.fhv.at İnternet Kaynağı	<% 1
46	tsukuba.repo.nii.ac.jp İnternet Kaynağı	<% 1
47	www.magnanimitas.cz İnternet Kaynağı	<% 1
48	Erez Cohen. "Telework in Israel during the COVID-19 pandemic and the related public policy", Israel Affairs, 2023 Yayın	<% 1
49	R. J. Kuo. "A decision support system for the stock market through integration of fuzzy neural networks and fuzzy delphi", Applied Artificial Intelligence, 1998 Yayın	<% 1

50	Ward van Zoonen, Anu Sivunen, Kirsimarja Blomqvist, Thomas Olsson, Annina Ropponen, Kaisa Henttonen, Matti Vartiainen. "Understanding stressor-strain relationships during the COVID-19 pandemic: the role of social support, adjustment to remote work, and work-life conflict", Journal of Management & Organization, 2021 Yayın	<% 1
51	core.ac.uk İnternet Kaynağı	<% 1
52	curationis.org.za İnternet Kaynağı	<% 1
53	fr.slideshare.net İnternet Kaynağı	<% 1
54	mdpi-res.com İnternet Kaynağı	<% 1
55	openrepository.aut.ac.nz İnternet Kaynağı	<% 1
56	pure.coventry.ac.uk İnternet Kaynağı	<% 1
57	repository.president.ac.id İnternet Kaynağı	<% 1
58	studentsrepo.um.edu.my İnternet Kaynağı	<% 1

59	www.pearsonjournal.com İnternet Kaynağı	<% 1
60	www.researchbank.ac.nz İnternet Kaynağı	<% 1
61	www.worldacademicunion.com İnternet Kaynağı	<% 1
62	www.zbw.eu İnternet Kaynağı	<% 1
63	Metin I. Eren, Michelle R. Bebbler, Dan Wilcox, Brett Story, Briggs Buchanan. "North American Clovis Point Form and Performance II: An Experimental Assessment of Point, Haft, and Shaft Durability", Lithic Technology, 2021 Yayın	<% 1
64	Yu-Lung Hsu, Cheng-Haw Lee, V.B. Kreng. "The application of Fuzzy Delphi Method and Fuzzy AHP in lubricant regenerative technology selection", Expert Systems with Applications, 2010 Yayın	<% 1
65	Mwaikambo, Eric, Abbas Rajabifard, and Martin Hagai. "Modelling cost estimation for accessing spatial data using fuzzy logic and time-driven activity based costing in the context of an NSDI", Journal of Spatial Science, 2015. Yayın	<% 1

66 Sangeeta Pant, Priya Garg, Anuj Kumar, Mangey Ram, Akshay Kumar, Hitesh Kumar Sharma, Yury Klochkov. "AHP-based multi-criteria decision-making approach for monitoring health management practices in smart healthcare system", International Journal of System Assurance Engineering and Management, 2023
Yayın

<% 1

67 www.intechopen.com
İnternet Kaynağı

<% 1

68 "Handbook of Large-Scale Distributed Computing in Smart Healthcare", Springer Science and Business Media LLC, 2017
Yayın

<% 1

Alıntıları çıkart
Bibliyografyayı Çıkart

üzerinde
üzerinde

Eşleşmeleri çıkar

Kapat

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