CURRENT INTERDISCIPLINARY
ACADEMIC RESEARCH

Editor:
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ARTİKEL AKADEMİ: 409

Current Interdisciplinary Academic Research

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ISBN 978-625-5674-49-4

1st Edition: December 2025

Publisher Certificate No: 19708

Cover and Book Design: Artikel Akademi

PRINTING: Uzunist Dijital Matbaa Anonim Şirketi
Akçaburgaz Mah.1584.Sk.No:21 / Esenyurt - İSTANBUL

Certification No.: 68922

KARADENİZ KİTAP LTD. ŞTİ.
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CONTENTS

FOREWORD

Interdisciplinary research has become a defining characteristic of contemporary scholarship, dri-ven by the increasing complexity of global academic and societal challenges. Current Interdiscipli-nary Academic Research brings together original studies from diverse disciplines, demonstrating how analytical depth and methodological rigor are strengthened through cross-disciplinary enga-gement.

The contributions in this volume brings together original research contributions from a range of academic fields, including tourism studies, social policy, art and design, engineering, ergonomics, and digital transformation. While each chapter is firmly rooted in its respective disciplinary fra-mework, the collective structure of the book underscores the productive potential of interdiscipli-nary dialogue.

This volume is intended to serve as a meaningful resource for researchers, academics, and postg-raduate students seeking an integrated perspective on contemporary academic research. It is hoped that the studies presented here will encourage further interdisciplinary inquiry and contribute to the development of innovative scholarly approaches.

Assoc. Prof. Dr. Meral ÖZOMAY
Editor

CHAPTER 1

CONCEPT, DYNAMICS AND BASIC REASONS OF CRISIS IN THE TOURISM SECTOR

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1. INTRODUCTION

Tourism has an important place in today's world economy. While many sectors are experiencing stagnation or even decline, tourism is an impetus for other sectors thanks to its dynamic structure. The tourism sector is of great importance not only because of the contributions it provides to the country's economy, but also in terms of improving and maintaining the country's image in the international arena. Therefore, tourism, which is a service sector, is rapidly developing in the world despite being a sector that is quickly affected by emerging or potential crises. Today, the tourism sector alone accounts for more than 30% of global service trade. Technological developments, improvements in living standards and the travel freedom provided by globalization have caused the number of people participating in tourism activities and tourism revenues to increase rapidly. According to the 2024 data of the UN World Tourism Organization, the tourism sector has an extremely important position in the world economy with its revenue of 1.590 billion dollars and the number of tour-

1 This study is partially based on the author's master's thesis submitted to Çukurova University in 2016.

ists reaching 1.445 million. Especially after 1980, the importance of tourism in the economy has increased with the increase in support and investments in the sector. The tourism sector has a strategic role in the country's economy due to its contributions to the balance of foreign payments, national income, employment, regional development and foreign direct capital inflows. Therefore, it is of great importance to determine the extent to which the financial situations of tourism businesses are affected by crises.

Crisis is a frequently used phenomenon in social sciences, but it is a complex and multi-dimensional concept that is difficult to define. The term's use in different contexts makes it difficult to create a clear and common definition; even experts in crisis research are reluctant to provide a single definition of the concept. The concept of crisis is derived from the Greek word krisis, which literally means decision-making. The use of the term crisis has increased significantly both in economic literature and in daily life since the 1990s. During this period, globalization, increased transparency in financial markets and rapid developments in information technologies have facilitated capital movements and diversification of financial instruments. At the same time, these developments have created a basis for crises to spread more rapidly and be perceived more distinctly.

Crises in the tourism sector are not limited to decreases in accommodation occupancy rates or tourist arrivals. It can negatively affect cultural events, conferences and other organizations and can also cause a decrease in consumer spending, creating significant damage at both economic and socio-cultural levels. The causes of crises in the tourism sector include both internal and external factors. Internal factors may arise from elements such as problems in the organization structure of the business, inadequacies in service quality, shortcomings in human resources management and financial management errors. External factors include events that occur outside the control of the business, such as economic conditions, environmental and technological developments, competition, natural disasters, and political and legal regulations. Such external crises can cause sudden declines in tourism demand, seriously threatening both destination revenues and the sustainability of tourism businesses.

The concept of crisis is of great importance for businesses operating in the tourism sector. The sustainability of the enterprises operating in the tourism sector depends on their ability to foresee crises, develop strategies to minimize the effects of possible crises and turn the crisis into strategic opportunities. In this context, it is of great importance to understand the concept of crisis correctly, to analyze its processes well and to develop appropriate management

strategies. These studies can contribute to the long-term competitiveness and economic stability of tourism businesses. Therefore, tourism businesses should develop mechanisms that can detect crises in advance, establish flexible organizational structures and improve their capacity for rapid and effective decision-making. This study investigates the concept of crisis in the tourism sector from a multi-dimensional perspective, analyzing the causes, types and effects of crises. The study also tries to evaluate the effects of crises on tourism businesses, destinations and the sustainability of the sector.

2. THE CONCEPT OF CRISIS

Crisis is one of the difficult concepts frequently used in social sciences. Due to its widespread use in social sciences, this concept lacks precision and originality. Therefore, even researchers working in the field of crisis intervention and research are reluctant to adhere to a single definition (Eastham et al,1970:463).

The term crisis derives from the Greek word "krisis", the main meaning of which is decision-making. Since the 1990s, the use of the concept of crisis in daily life in economic literature has become increasingly widespread. After the 1990s, globalization, increasing transparency in financial markets and rapid developments in information technologies have greatly changed the scope and nature of financial instruments. These changes in financial markets have facilitated the acceleration of global capital flows and the diversification of financial transactions and have also had a strengthening effect on the way crises are spread and perceived. In particular, developments in information and communication technologies have significantly affected and increased the use of financial instruments. This situation has made the scope and impact of crises more evident on a global scale (Gövdere&Öztürk,2010:379).

The concept of crisis is expressed in different ways in the social sciences literature. A crisis is the serious consideration of negative developments that challenge and weaken an organization's goals and competitive advantage. Crises emerge in undesirable, extraordinary and unexpected ways, causing chaos and uncertainty in businesses. Therefore, crisis management requires decision-making and timely implementation measures that minimize the negative effects of crises and positively affect corporate performance (Glaesser,2007:14).

A crisis is an extraordinary situation that directly affects the main goals and operational structure of an organization, threatens the continuity of the organization and requires immediate intervention. In these cases, the organization's

mechanisms for predicting and evaluating crises may become ineffective and may create an environment of chaos and uncertainty by significantly slowing down the organization's activities (Usul&Gençtürk, 2003:125).

The concept of crisis is often used in the same sense as situations that lead to instability, uncertainty, turmoil in organizations and make it necessary to take corrective measures. It occurs when normal business activities are disrupted in response to psychological, political, economic or social developments and existing solutions fail (Yılmaz et al, 2011:189).

The crisis shows the critical importance of decision-making mechanisms of organizations and businesses in situations expressed by uncertainty, extraordinary occasions and unforeseen circumstances These mechanisms allow timely and accurate interventions to reduce the negative effects of crises and ensure institutional continuity.

2.1. The Basic Characteristics of Crises

The most striking aspect of crises is the unpredictability that undermines decision-making. The uncertainty of the future, scarce resources and time constraints often make the crisis prevention and prediction mechanisms of organizations inadequate for organizations. The stress and indecision that decision makers experience during this process further worsen the effects of the crisis. Crises are occasions that have no boundaries and cause serious damage to a business's image, economic situation, human resources and other activity units. The basic features of crises can be outlined as follows.

- Crises lead to negative situations such as panic, pressure and anxiety among managers and decision makers.
- Crises are often unpredictable and unexpected occasions.
- Crises threaten the goals and existence of organizations.
- The information and time required to manage the crisis are limited.
- The crisis prevention and prediction mechanisms of organizations are often not sufficient.
- Crises require strategic, swift and effective response

Crises cause pressure on organizations due to their uncertainty and unpredictability and crisis seriously threaten the organizations' goals and existence. In this context, timely and correct intervention is important for effective and strategic crisis management (Tutar,2011:18; Asunakutlu et al, 2003.143).

2.2. The Crisis Process in Organizations

The crisis process consists of three basic phases: potential crisis period, crisis period and post-crisis period. Each of these phases shapes an organization's ability to cope with the crisis and the management approaches that should be implemented. The functioning of the crisis process in organizations can be presented through these three basic phrases, as shown in Figure 1.

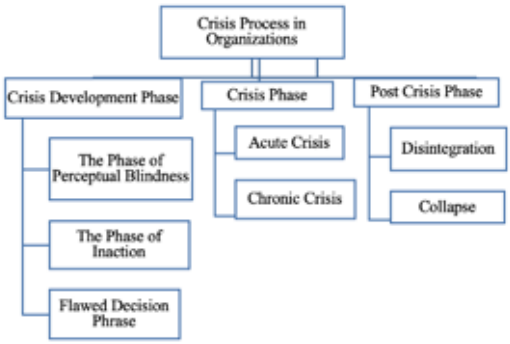

***Figure 1**: Phases and Types of Crisis in Organizations*

2.2.1. Crisis Development Phase

The development phase of the crisis in organizations occurs in three phases: perceptual blindness phase, inaction phase and flawed decision-making phase.

2.2.1.1. The Phase of Perceptual Blindness

The blindness phase is the period in which external-internal changes that may be problematic for the organization's activities become apparent and problems begin to arise in the organization's relations with the environment in which it operates. At this stage, situations such as the ambiguity of goals, disorder in the flow of information and communication, an increase in the number of employees and the invalidation of the organizational structure arise. Therefore, during the perceptual blindness phase, organizations should focus on activities such as goal setting, organizational development, information provision, sharing, analysis and participatory management (Aymankuy,2001:108, Göral, 2014:92).

2.2.1.2. The Phase of Inaction

The second phase of the crisis development process, inaction, in other words the inertia phase, refers to a period in which managers do not develop any strat-

egy despite the fact that organizational performance decreases significantly; work accidents, costs, complaints increase and productivity decreases. At this stage, managers avoid taking necessary measures due to reasons such as the belief that the cost of responding to the crisis will be high or that the crisis will go away on its own.

2.2.1.3. Flawed Decision Phrase

This stage refers to a period when managers have difficulty making creative decisions due to anxiety and panic. Therefore, managers may make decisions based on sudden and inaccurate information. The poor flow of information in the organization and the centralization of decisions also negatively affect the process. All these factors cause erroneous actions and flawed decisions and deepen the crisis even more

2.2.2. Crisis Stage

This is the stage when clues about the crisis appear and symptoms worsen. This stage is the period when the organization needs to be more sensitive in its relations with its external environment. The crisis phase generally consists of two stages: acute crisis period and chronic crisis period.

2.2.2.1. Acute Crisis

In the acute crisis phase, the psychological, financial and physical problems that the organization and its environment will experience reach extreme levels, tension, uncertainty and complexity increase in the organization and performance deterioration reaches unstoppable levels. It is a situation of hurry and tension in an organization where there is no planning and only ad hoc activities are carried out (Göral,2014:92).

At this stage, when the effects of the crisis become evident, rapid and effective decisions must be taken to prevent performance decline and possible loss of life and property. The aim is to reduce the damage caused by the crisis and to take control of the situation in line with the organization's main goals (Ritchie,2004:672).

2.2.2.2.2. Chronic Crisis

The chronic crisis phase is the phase in which the intensity of the crisis begins to decrease, the events calm down gradually, the effect of the crisis decreases but does not end. This phase is the process of long-term recovery and regenerative process. The chronic phase is the phase in which organizational cleaning, end-of-event evaluation, improvement, correction of environmental

problems, and revision of re-investment decisions and disaster strategies are carried out. In this context A successful crisis management that thinks strategically can limit the chronic crisis period and end the crisis more quickly (Ritchie,2004:672).

2.2.3. Post-Crisis Stage

This phase is the period in which the crisis is brought under control, its effects are tried to be reduced and the process comes to an end. The post-crisis phase consists of two sub-phases: disintegration and collapse (Güneş&Beyazit,2010:18).

2.2.3.1. Resolution Stage

This stage is the period when routine renewal decisions are made and a number of new improvement strategies are determined for the organization. At this stage, the organization or tourist destination sees the crisis as an opportunity for change and makes new decisions regarding resource use through reinvestment strategies (Ritchie,2004:672).

The disintegration phase is the period when the organization begins to return to normal activities after the crisis. The post-crisis recovery phase is the period when the organization begins to return to normal operations after the crisis. At this stage, the effects of the crisis are brought under control and necessary steps are taken to completely eliminate the existing negativities (Beyazit&Güneş,2010:18).

Acting quickly during the resolution phase of the crisis prevents the crisis from spreading. This stage requires regular collection of information to adapt to constantly changing conditions and effective communication with employees, shareholders, suppliers and customers. It is important for the management to explain its approach to the crisis and to evaluate the crisis management process. Besides, it is of great importance to record every moment of the process so that lessons can be learned from the crisis (Luecke,2009:107).

2.2.3.2. Collapse Stage

The collapse phase refers to the situation in which the crisis cannot be brought under control due to errors or wrong decisions in crisis management. Analyses conducted at this stage indicate that the organisation will not be able to continue its activities in the medium and long term. The organization suffers heavy losses, both financially and operationally, and is unable to return to normal operations. The collapse period represents a critical phase in which

the effects of the crisis are most intense, and recovery is extremely difficult or impossible. At this phase, the depletion of organizational resources and the dysfunction of decision-making mechanisms drag the organization into a serious environment of uncertainty and chaos (Göral,2014:92).

Therefore, the crisis process in organizations consists of different stages from the emergence of potential crisis signals to post-crisis recovery. Each phase presents unique challenges that require timely detection, effective decision-making and strategic intervention. Acute crises require swift action to mitigate damage, while chronic and post-crisis periods focus on recovery, evaluation and adaptation.

3. THE CONCEPT OF CRISIS IN THE TOURISM SECTOR

There have been various definitions of the concept of crisis in tourism in social sciences. Crises in the tourism sector are events that affect both domestic and international tourism activities, leading to a decrease in the number of tourist consumers in popular tourism markets. The tourism sector in the world has faced many different types of crises in recent years. Crises can be temporary or permanent, depending on the nature of the causes and consequences. While permanent crises are related to the competitiveness and development of the tourism region, temporary crises may be caused by an external reason. Natural disasters such as tsunamis, earthquakes and volcanic eruptions, epidemics such as SARS, Foot-and-Mouth Disease and Ebola and terrorist attacks targeting tourists and society that threaten personal security lead to temporary crises (Martin &Soria,2014:55-56).

In the tourism industry, the crisis is caused by external factors such as legal/political regulations, competition, economic factors, natural disasters, technological conditions, terrorism, epidemics, political crises and war, as well as by the top management of the organization or the organizational structure (Bahar et al, 2011:85).

In times of crisis in the tourism sector, there is a significant decrease in the number of congresses organized, accommodation facilities, tourist trips for cultural purposes, the number of visitors of travel agencies and restaurants. Moreover, crises push individuals to save, leading to significant decreases in their average spending (Avcı&Küçükusta, 2013:573).

Crises in the tourism sector can be divided into two sub-headings: permanent crises and temporary crises. This classification allows for a systematic

evaluation of the way in which crises occur, their effects, duration of impact and their impact on the sector.

3.1. Persistent Crises

Permanent crises are directly related to the competitiveness or development stage of a tourism region. Since such crises are caused by long-term structural problems, Permanent crises negatively affect the competitiveness of the tourism destination and threaten its sustainability (Martin &Soria,2014:55-56).

3.2. Temporary Crises

Non-permanent crises are usually caused by external factors. Natural disasters (such as tsunamis, earthquakes, volcanic eruptions), epidemics (such as SARS, foot-and-mouth disease, Ebola) and terrorist attacks that threaten personal security can lead to short-term but serious crises in the tourism sector. Such crises occur suddenly, cause dramatic declines in tourism demand, but can be controlled with appropriate measures and strategic and effective management (Martin&Soria,2014:55-56)

4. CRISIS MANAGEMENT IN TOURISM

Crisis management refers to detecting events that occur unexpectedly and may lead to economic and socio-cultural losses by negatively affecting the image of a country, a tourist region, an enterprise or a tourist product specific to the region. In this process, the aim is to help the business overcome the crisis with the least loss by determining priorities, taking necessary measures and creating protection mechanisms (Akıncı et al,2012:81)

Crisis management is a technique used to plan for unexpected events in the future. It is also a method used to reduce the consequences of the disaster that will occur when a crisis occurs. The tourism sector is a sector that is frequently exposed to unexpected events and is sensitive and susceptible to external influences. For example, traffic accidents, natural disasters, terrorist attacks and infectious epidemics that occur in a region or country can have a serious impact on the tourism sector. In addition, events such as bomb attacks on public transportation vehicles, oil spills in a port or on the beach, earthquakes or volcanic

eruptions in a destination can lead to crises in tourism. During a crisis, the proper use of information, sharing, education, awareness and new information are important elements in overcoming the crisis at the least cost. The lack of effective crisis management and processes during periods of major crisis, such as the explosion at the Fukushima nuclear power plant in Japan and the hurricane disaster in New Orleans, the impact of the crisis can last for years. Therefore, decision support systems and knowledge-based crisis management mechanisms are vital for national and local tourism businesses (Jia et al, 2012:139-140).

In crisis management, the ability of the management to act quickly and effectively in situations that negatively affect the activities of the business and threaten the existence of the business is important. Therefore, many factors such as the organizational climate, the effectiveness of communication, the field of activity of the organization, financial resources, management approach, environmental conditions and organizational structure can be determining in crisis management olabilmektedir (Fırat&Açıkgöz, 2011:4).

Crisis management plans that businesses have against disasters caused by humans or natural means can be used as an important marketing tool to attract tourists to the region or to keep tourists in the region (Rittichainuwat,2013:112-114).

As a result, crisis management should manage the process well by developing the right policies in situations such as a decrease in the number of tourists and an increase in uncertainties due to the crisis. In addition, crisis management should anticipate the negative consequences of the crisis, take necessary measures and develop strategies that will turn the resulting conditions into an advantage.

4.1. Stages of Crisis Management

Crisis management is a process that consists of three basic stages: pre-crisis stage, crisis stage and post-crisis stage. These stages are carried out systematically to minimize the effects of crises and ensure the sustainability of the business.

4.1.1. Pre-Crisis Stage

The pre-crisis phase is the phase that includes the identification of potential crisis situations and the plans for the developing crisis. The pre-crisis phase includes a historical investigation of the socio-cultural, technological, environ-

mental, political, commercial and economic factors that may lead to crises in the tourism sector. In this context, past disasters, global, regional and national changes that may affect tourism regions are investigated; possible crisis scenarios are determined, and appropriate strategies are developed against these crises (Jia et al,2012:139; Küçükusta&Avcı, 2013: 575

4.1.2. Crisis Stage

During the crisis phase, the organization experiences indecision and panic, depending on the impact and magnitude of the crisis. Depending on the severity of the crisis, necessary measures are taken and efforts are made to reduce the negative effects of the crisis (Güneş&Beyazıt, 2010:18)

During crisis periods, tourists are more sensitive to prices, so there are serious price reductions, especially in accommodation businesses, due to the decrease in demand. The decline in demand negatively impacts management and operational processes, leading to significant decreases in room revenues, daily prices and occupancy rates for accommodation establishments. On the other hand, luxury and upper segment hotels like Hilton, which prioritize quality and branding, appeal to a high-cost customer base, and have a competitive advantage, do not approach price reductions during crisis periods in order to protect their long-term brand image. Therefore, businesses with no crisis management plan, low competitiveness, and low service quality are more exposed to the negative effects of crises (Küçükusta&Avcı, 2013: 576).

4.1.3. Post-Crisis Stage

The post-crisis phase is the process in which corrective and remedial activities are carried out in order to regain the trust of the society and the public, and the aim is to return the business to its pre-crisis state. At this stage, restoration, sourcing and restructuring strategies are implemented; the effectiveness of the strategies and responses used during the crisis are evaluated. According to the feedback received, organizations and tourism destinations review their current situation and make new decisions for the future (Lia et al., 2012: 139; Ritchie, 2004: 674).

The post-crisis period is a process in which significant changes occur in the structure of the business and its relations with the external environment, aiming to regain the standards of the pre-crisis period. At this stage, businesses try to find permanent solutions to the crisis by using both internal and external resources. At the same time, this period is the last opportunity for the business to respond effectively to the crisis and represents the critical stage between

disintegration and collapse. At this stage, businesses can support post-crisis recovery by preparing training programs that include all managers and staff, rewarding successful employees, improving the working environment and focusing on efforts to strengthen the business image (Akıncı, 2010: 72; Seçilmiş&Sarı, 2010: 506–507).

5. FACTORS LEADING TO CRISES IN THE TOURISM SECTOR

The tourism sector is a socio-cultural activity that meets people's recreation, entertainment and cultural needs, as well as being of great economic importance for developed and developing countries with its employment and foreign exchange revenues (Aymankuy, 2001: 109).

Crises reduce people's income and tourist expenditures, by reducing tourism demand, which negatively affects the tourism sector and businesses operating in the sector. Due to the high flexibility of demand, the tourism sector is affected rapidly and seriously by wars, disasters, terrorist incidents, economic and financial crises, epidemics and socio-cultural problems. Besides, the fact that touristic demand depends on individuals' income levels, the distance of the destination, personal security, service and product prices, and individual preferences and tastes; more increases the elasticity of demand compared to other sectors and makes tourism more vulnerable to internal and external crises. Therefore, international problems, security threats, negative propaganda and political/economic instability negatively affect tourist demand and businesses (Durgun & Yıldız, 2011: 7–8).

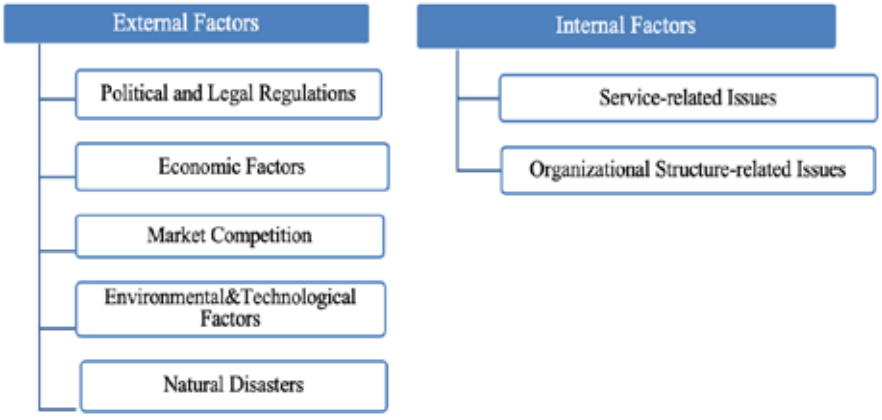

***Figure 2**: Factors Causing Crises in the Tourism Sector*

5.1. External Factors

External environmental factors that originate from outside the enterprise and cannot be controlled include national and international factors such as natural disasters, economic developments, political and legal regulations, competitive conditions and technological changes. In the tourism sector, especially in terms of accommodation and travel agencies, it is often not possible to prevent external risks from turning into a crisis. Therefore, the influence of sector management in preventing external factors from escalating into crises remains limited.

5.1.1. Political and Legal Regulations

Legal and political regulations can affect the organizational and managerial functions of businesses in a positive or negative way. Political risk factors in the country where businesses operate are an important source of crisis. A crisis may arise if businesses fail to adapt to new decisions taken by states in social, political, economic and legal fields. Therefore, businesses are affected by the country's legal systems. Regulatory rules such as decrees, statutes and laws are created by states and form the legal order in the country. States' intervention in the market through different means can be an opportunity for some businesses, but a source of crisis for others (Tutar,2004:32).

Laws and regulations in a country directly affect accommodation businesses operating in the tourism sector. Changes in Value Added Tax rates applied to tourism-related goods and services, entry-exit fees for international visitors, and regulations regarding the production and sale of food products significantly affect the cost structure and competitiveness of accommodation businesses. In addition, sector-specific regulations such as the closure of casinos may eliminate some types of tourism, while creating new investment opportunities in other areas. In addition, travel bans, visa restrictions and international sanctions imposed by governments on foreign tourists or their own citizens for various reasons directly affect tourism demand. Therefore, political interventions and the legal framework seriously affect accommodation businesses in both financial and operational terms (Demirel et al., 2012: 82; Seçilmiş&Sarı, 2010: 503).

5.1.2. Economic Factors

General economic fluctuations, uncertainties, changes in the foreign trade regime, disruption of the supply-demand balance, price increases in basic inputs, shortages and serious deterioration in the balance of payments negatively affect business activities. In addition, high inflation caused by psychological

and economic reasons and the decrease in the purchasing power of the people increase these effects (Tutar,2011:299

The tourism sector is sensitive, open to external influences and rapidly affected by crises in global financial markets due to its dynamic structure. Since tourism expenditure is not mandatory, tourism expenditures are among the first expenditure to be cut back during economic downturns. Therefore, economic crises that occur on a national, regional and international scale affect the tourism sector more due to its fragile structure (Sarıçay&Ünal,2014:17).

Economic crises in international financial markets create uncertainty in indicators such as income, savings, unemployment, inflation, purchasing and borrowing power and lead to decrease in tourism demand. This situation reduces the arrival of both local and foreign tourists and leads to a narrowing in tourism activity. In times of economic crisis, the decline in occupancy rates, the increase in sectoral unemployment and the costs exceeding the revenues are important crisis indicators for tourism businesses (Karaçor&Garda, 2015:903).

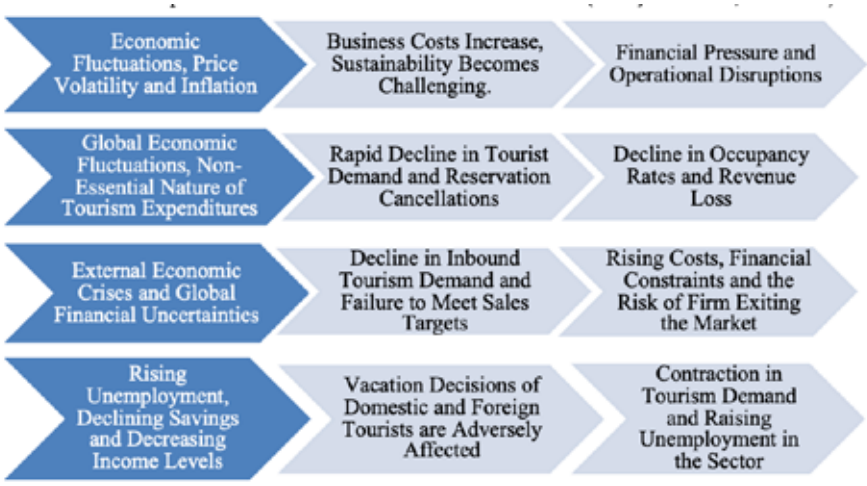

***Figure 3**: The Impact of Economic Factors on the Tourism Sector*

Source: The figure was prepared by the author based on a literature review and explanations of the topic.

Economic factors are among the most important external factors affecting the tourism sector both in terms of demand and supply. Global or national economic slowdowns reduce individuals' disposable income, leading to a decrease in tourism demand. On the supply side, economic fluctuations and inflation

increase input costs, creating cost pressure on businesses. In particular, external economic crises negatively affect the sector by reducing international tourism demand. This case makes it difficult for accommodation businesses and travel agencies to achieve their sales targets, restricts access to external financing, leads to a decrease in demand, reservation cancellations and cost increases

5.1.3. Market Competition

Technological developments and globalization have led to markets becoming smaller and turning into a single global market. Competition conditions have changed significantly due to the swift buying and selling of financial resources, the elimination of transportation and time obstacles and the increase in the number of companies. Therefore, companies that make strategic plans by taking into account the rapid changes in the external environment and the hardening competitive environment are more successful. Initially, the competition between accommodation businesses offering similar tourist products and services has become increasingly intense due to supply-demand imbalances in the sector and increasing competitive pressure. This case has led businesses to offer higher quality and differentiated services, increasing the struggle to provide customer satisfaction and loyalty (Aksu, 2000:271–276).

Many factors determine the tourism competitiveness of countries in international markets. Macroeconomic factors such as exchange rate, income level, capital costs, import volume and tax types are among these. The climate, beaches, natural life, museums, handicrafts, festivals, historical buildings and cultural heritage constitute natural and cultural attractions. Accommodation and transportation facilities, environmental arrangements and other infrastructure investments are also important factors that increase competitiveness. In addition, the quality of human resources, product prices and service quality are among the supply-side factors. The size of the sector, international market conditions, seasonality and the variety of tourist products shape the demand side. The applied tourism policies also directly affect the competitiveness of both enterprises and countries in tourism (Vanhove, 2005:75–124).

Table 1: Determinants of Competition in the Tourism Sector

Macroeconomic Factors	Natural&Cultural Resources	Infrastructure&Service Quality	Supply&Demand Factors	Destination Management&Competition
Exchange Rate	Climate&Beaches	Accommodation	Product Prices	Technology
Income Level	Historical Buildings	Transpotation	Service Quality	Advertising&Marketing
Taxs	Festivals	Human Capital	Seasonality	Destination Image
Tourism Expenditures	Cultural Values	Environmental Regulations	Variety	Customer Satisfaction

Source: The table was prepared by the author based on a literature review and explanations of the topic.

Macroeconomic factors, natural and cultural resources, infrastructure, service quality, supply demand elements and destination management and strategic factors. These elements shape the competitive advantage of businesess through destination attractiveness, service quality and customer satisfaction, while also reflecting the multidimensional structure of the sector.

Harvard Business Professor Michael Porter explained the factors that determine the level of competition in an industry with the five forces principle. Porter's model provides an analytical framework for understanding the competitive strength of businesses in the markets in which businesses operate and the underlying reasons that shape competition. It also helps assess the profitability potential of the market. These elements were presented in Figure 4.

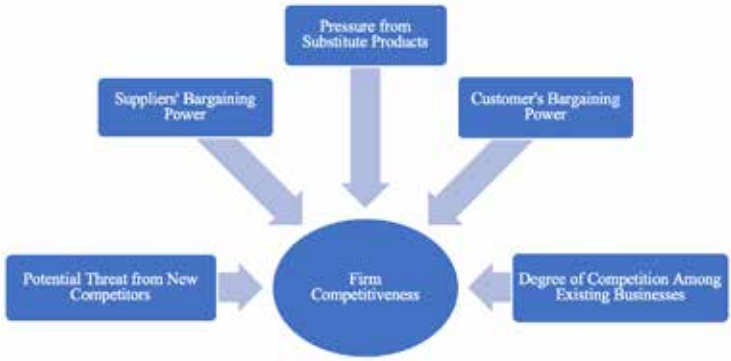

***Figure 4**: Competition Within the Framework of Porter's Five Forces*

Source: The figure was prepared by the author based on a literature review and explanations of the topic.

As represented in Figure 4, a company's competitive power is directly influenced by five forces originating from the external environment. Any change in one of these factors may adversely affect the firm's operational performance and consequently shape its competitive strength. Each force can influence the firm's market share, profitability and strategic position either positively or negatively.

The competitive structure in the tourism sector can be explained by Porter's Five Forces Model, as in other sectors. The superiority achieved in these forces offers businesses the opportunity to invest in sub-sectors such as tour operating, airline transportation and amusement parks (Vanhove, 2005:110).

Competition in the tourism industry is influenced by many interrelated factors. These factors include measurable elements such as information technologies, human capital, advertising, promotional activities, the presence of natural resources, the distance to the destinations and exchange rates. In addition, qualitative factors such as historical and cultural heritage, tourist satisfaction, destination image and protection of the natural environment also significantly affect competitiveness. The competitive advantage for tourism businesses is provided by customer-oriented strategic practices. In this context, it is of critical importance to analyze customer demands correctly, to carry out a strong branding process and to continuously improve service quality. Food, beverage, hotel, entertainment and travel enterprises operating in an environment where technological innovations and globalization are progressing rapidly should use

their resources effectively in line with their business goals. Tourism businesses also need to analyze the external environment and competitive conditions well and develop appropriate policies and effective marketing strategies.

5.1.4. Environmental and Technological Conditions

Technology is an important factor in business. Nowadays, the importance of information and technology has increased considerably. Businesses that have sufficient knowledge and technology encounter fewer problems in adapting to changing environmental conditions. Accommodation enterprises have started to use technological opportunities such as interactive TVs and customer recognition systems especially since the 1990s. Accommodation enterprises have shown the use of these technologies as an important element of competition (Aksu, 2000:273–274)

Since communication is very important in the tourism sector, information technologies have a critical place. These technologies enable tourists to access accurate and reliable information in a short time. It also makes it easier to make reservations, improves service quality and increases customer satisfaction. Thanks to the internet, it is possible to access the latest prices and facilities of the region to visit, holiday packages, accommodation, travel and entertainment services in an easily comparable way. Information technologies have a wide range of uses in airline companies, tour operators, travel agencies and accommodation facilities. Airlines needed these technologies early on in order to manage their complex operations and plan inventory accurately. The internet provides significant advantages in electronic ticket sales, online reservations, reorganization of agency commissions and last minute ticket sales. Travel agencies, on the other hand, easily access information about many units such as hotel chains, scheduled flights and car rental companies thanks to global distribution systems. These systems also provide effective coordination between forward and backward services within the organization. Information technologies in the hospitality industry are of great importance in terms of increasing profitability, managing capital efficiently, expanding the field of activity and facilitating operations. Packaged programs such as Fidelio used in hotels provide coordination of front office, sales, planning and reservation operations. It also increases management effectiveness by integrating with other units such as accounting-finance, market research, purchasing, personnel and production (Buhalis, 2005:710–723).

As companies become more dependent on computers for information stor-

age, commerce, operational processes, communication and research, the risk of crises due to technical infrastructure failures also increases. Today, many businesses have become unable to operate without software and smart hardware. Therefore, a collapse in the technical infrastructure can render information systems dysfunctional and directly plunge businesses into a crisis situation (Luecke, 2009:9).

Technological tools such as national, regional, international TV channels and the internet provide fast and low-cost access to large audiences in marketing the services offered in the tourism sector. Technological developments have also significantly changed the marketing strategies of tourism goods and services. For example, in France, the Minitel system, which integrated ATMs and personal computers, allowed consumers to make reservations without going to a travel agency, hotel or transportation company. Similarly, the Prestel system used in the United Kingdom offered the same convenience to consumers by making the booking process more accessible (Demirci, 2003:74).

Developments in technological tools have greatly changed the traditional functioning of the tourism sector. Online reservations made through hotels' websites and direct ticket sales offered by airlines' own websites create a significant risk for intermediary travel agencies. In return, these practices provide airlines with a significant cost advantage. Similarly, accommodation businesses are also bypassing agencies and marketing their rooms and services directly over the internet. This reduces costs and increases the competitiveness of businesses. The service-oriented nature of the tourism sector creates a higher level of labor demand compared to other sectors. Information technologies such as the Internet provide direct access to job seekers. In this way, businesses can employ personnel with the required qualifications quickly and at low cost. Additionally, technological developments make it easier to promote products and services. Additionally, technological advancements allow managers to analyze the causes of employee turnover and help them develop better working conditions to reduce turnover. Technological developments provide significant advantages to businesses, but Technological developments can also cause crises from time to time. Unexpected malfunctions in computer systems or software can cause serious problems for accommodation businesses. Failure to resolve these malfunctions quickly leads to disruption of communication with internal and external stakeholders. As a result, the business may face a direct crisis situation. Similarly, technological disruptions are a significant source of crisis for travel agencies and large tour operators in the tourism sector. In particularly busy periods such as July and August, failure to resolve computer malfunctions

in a timely manner can seriously disrupt operations and put the business in a crisis situation. besides, some accidents can lead to financial losses and even the complete halt of business operations (Tanrısevdi, 2002:90).

The tourism sector can also be negatively affected by environmental and technological crises. In this context, major accidents such as Chernobyl, Union Carbide and Exxon Valdez, which led to leaks, explosions and fires, are important examples of crises that have serious impacts on the environment. The disaster that occurred at the Chernobyl Nuclear Power Plant in Ukraine on April 26, 1986, had serious effects on the environment and neighboring countries. It has been determined that the Chernobyl accident negatively affected the foreign tourism of countries such as Sweden and Turkey and caused significant declines in tourism demand in these countries. The fact that the Chernobyl Disaster occurred in a region close to Turkey caused serious effects on the Turkish tourism sector. This case has led to significant decreases in the number of tourists visiting Turkey and in tourism revenues.

Years	Tourism Revenue (Million USD)	% Change in Revenue	Tourist Arrivals	% Change in Tourist Arrivals
1984	840,000	104,33	2,117,094	30,27
1985	1,482,000	76,42	2,614,924	23,51
1986	1,215,000	-18,01	2,391,085	-8,56
1987	1,721,117	41,65	2,855,546	19,42
1988	2,355,295	36,84	4,177,726	44,20

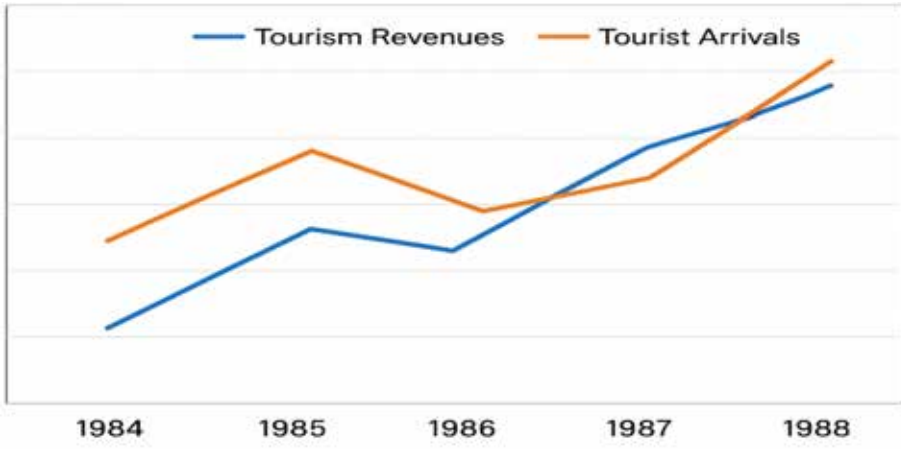

***Figure and Table 5**: Change in Turkey's Tourism Revenues and Tourist Arrivals (1984-1988)*

Source: Data retrieved from the Republic of Türkiye Ministry of Culture and Tourism; figure and table created by the author.

As seen in Figure 5, there was a significant decrease in both tourism revenues and the number of tourists due to the technological and environmental disaster that occurred at the Chernobyl Nuclear Power Plant in 1986.

Technological and environmental conditions in the tourism sector directly affect the likelihood of businesses encountering crises. Technological infrastructure malfunctions, sudden system failures or software errors can lead to operational crises, causing service disruptions and customer dissatisfaction. Similarly, environmental disasters and technological accidents can cause sudden declines in tourism demand, resulting in revenue losses for businesses. For example, the disaster that occurred at the Chernobyl Nuclear Power Plant in Ukraine on April 26, 1986, led to a decrease in tourism demand in Turkey and neighboring countries and a significant decline in tourism revenues. This situation shows that crisis management and risk planning are of critical importance for tourism businesses. Investments in technology and comprehensive environmental risk assessments are emerging as a strategic necessity in terms of preventing crises and minimizing their impacts.

5.1.5. Natural Disasters

Natural disasters that cause great losses such as earthquakes, hurricanes, tropical storms, volcanic eruptions and floods cause a slowdown in growth and development and a loss of capital in the long term. In the short term, it has negative effects on inflation, growth and employment (Akar, 2013:189).

Table 2 classifies natural disasters under five main categories: geophysical, climatic, hydrological, meteorological and biological

Table 2*:* Classification of Natural Disasters

Geophysical	Climatic	Hydrological	Meteorolgical	Biological
Earthquake	Drought	Flood	Hurricane	Epidemic
Volcanic Eruption	Extreme Heat	Flash Flood	Tropical Storm	Bacterial Diseases
Mass Movement	Extreme Winter	Landslide	Wildfire	Viral Diseases
	Frost	Avalanche	Local Storm	Parasitic Diseases
		Storm Surge	Extratropical Storm	Fungal Infections

Source: Annual Disaster Statistical Review 2013: The Numbers and Trends

One of the important factors that cause crises in the tourism sector is natural disasters. Disasters such as earthquakes, volcanic eruptions, environmental pollution, erosion, floods, fires, hurricanes, droughts, collapses and landslides consist of elements from soil, air and water. For example, major earthquakes that occurred in Japan in January 1995, in Turkey in August 1999 and in Taiwan in September 1999 had a serious impact on the tourism industry. Similarly, the Indian Ocean earthquake and tsunami that hit Thailand in 2004 created a significant crisis for the country's tourism sector and hotel businesses (Akıncı et al., 2012: 82).

In August 2002, a major flood occurred in the southeastern and eastern parts of Germany and Eastern Europe as a result of the Elbe River overflowing and heavy rains. This incident led to the death of 20 people, the injury of 110 people and the displacement of thousands of people from their homes. Approximately 30,000 people were evacuated from the area in Dresden alone. The flood disaster significantly reduced tourist demand for the region and negatively affected the tourism sector. In fact, the number of tourists visiting the region in August and September 2002 decreased by 40% compared to the previous year. The number of visitors decreased by 362.000 people on an annual basis, the demand decreased by more than 8% and the total damage to the region's tourism reached 164.3 million euros (Glaesser, 2007: 75).

Turkey is a country where natural disasters occur frequently. The August 17, 1999, Kocaeli-Gölcük Earthquake and the November 12, 1999, Düzce Earthquake had caused great destruction. These earthquakes have caused thousands of people to lose their lives. In addition, there have been significant losses in infrastructure, wealth, production, labor force and tax revenues. Earthquakes have negatively affected not only the region, but the entire economy. This situation has also led to significant declines in demand for the tourism sector. A similar situation occurred in Mexico on September 19, 1985. Following the earthquake, there were up to 50% cancellations of reservations in the tourism sector. As a result, the number of tourists coming to the country has decreased by 10%. Hurricanes affected Belize in 2000–2001. Hurricanes that hit Belize in 2000–2001 caused serious damage in the country, where a large portion of the population is employed in the tourism sector. These disasters have brought tourism activities to a standstill and caused great economic damage throughout the country. The total cost of the hurricanes reached 33% of GDP (Tanrısevdi, 2002:49-50; Akar, 2013: 190).

As a result, natural disasters cause great losses both economically and socially. Such disasters weaken country economies and cause serious crises in the

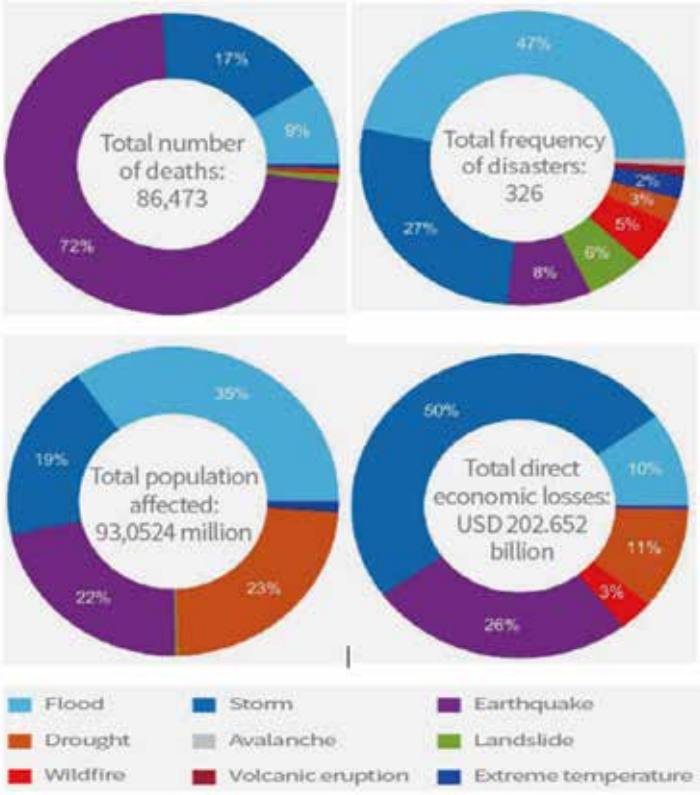

***Figure 6**: Breakdown of Frequency and Losses Per Disaster Type Worldwide in 2023*

Source: 2023 Global Natural Disaster Assessment Report

In 2023, there were a total of 326 major natural disasters affecting 117 countries and regions, excluding epidemics and infectious diseases. The distribution of these disasters was realized as follows: 152 floods (46.63%), 88 storms (26.99%), 27 earthquakes (8.28%), 19 landslides (5.83%), 16 forest fires (4.91%), 9 droughts (2.76%), 8 extreme heat/cold events (2.45%), 4 volcanic eruptions (1.23%) and 3 avalanches (0.92%).

A total of 86,473 people lost their lives in major natural disasters that occurred in the world in 2023. 72.22% of these deaths were caused by earthquakes (62,451 people), 16.96% by storms (14,666 people) and 8.98% by floods (7,763 people).

In 2023, a total of 93.05 million people were affected by major natural disasters worldwide. The most affected groups were floods (34.81%; 32.39 mil-

lion people), droughts (23.38%; 21.76 million people), earthquakes (21.76%; 20.25 million people) and storms (18.61%; 17.31 million people). In addition, extreme hot and cold weather events, landslides, forest fires, volcanic eruptions and avalanches are also among the other disaster groups.

in 2023, major natural disasters led to a total of 202.65 billion US dollars in direct economic losses. The largest part of these losses was caused by storms. Storms caused losses of $100.85 billion, corresponding to 49.76% of the total economic damage. Storms were followed by earthquakes (by 25.63%; US$ 51.94 billion), droughts (by 10.91%; US$ 22.1 billion) and floods (by 10.05%; US$ 20.37 billion), respectively.

As a result, natural disasters disrupt the flow of tourists, reduce revenues and significantly affect the tourism sector by damaging the reputation of destinations. This situation clearly reveals the necessity of developing effective risk management and durable tourism strategies.

5.2. Internal Factors

Internal crises that cause crises in the tourism sector are problems arising from the organizational structure of accommodation businesses and the services accommodation businesses offer. If such internal problems are not resolved in time, they may cause a crisis in the business.

5.2.1. Service-Related Crises

Low service quality, service disruptions, customers causing problems, disagreements between customers and staff, and security vulnerabilities in the business can lead to a crisis. Besides, mismanagement of the product life cycle and insufficient personnel in terms of knowledge and skills can also create crises in businesses (Seçilmiş&Sarı, 2010: 502–503).

Events that reduce service quality and create security problems in accommodation businesses can negatively affect the business image and lead to a decrease in demand. Incidents such as theft and food poisoning that occur in the facility create a negative impression about the business. In addition, fights between staff groups, either inside or outside the facility, can strengthen this negative perception and sometimes turn into a crisis for the business (Akıncı et al., 2012: 83; Glaesser, 2007: 15).

When an airline's planes repeatedly malfunction or crash, it is a serious ser-

vice failure. Similarly, it is a significant problem if a travel agency's customers constantly experience problems on tours. Likewise, a bus company frequently having accidents is also a serious problem. Therefore, such service-related problems seriously reduce the demand for the business and can drag businesses into crisis (Mat&Akkaşoğlu, 2015: 25).

***Figure** 7: Key Elements of Service-Related Crises in the Tourism Sector*

Source: The figure was prepared by the author based on a literature review and explanations of the topic

Service-related crises arise from factors such as poor service quality, staff shortages and security weaknesses and directly affect the operational performance, customer satisfaction and competitiveness of the enterprise. Therefore, it is critical to develop an effective crisis management strategy. Otherwise, such crises can seriously undermine the efficiency, reputation and market position of the business

5.2.2. Crises Related to Organizational Structure

The organizational structure is the embodiment of the organization's climate and culture. The organizational structure is determined by the span of control, the way authority and power are used, whether the organization is hierarchical or flat, and the degree of centralization. In addition, the management approach adopted plays an important role in shaping the organizational structure. Since crises occur untimely and unplanned, it is important for organizations to adapt to dynamic situations. This harmony is more possible in organic organizational structures. Mechanical organizational structures, on the other hand, increase the risk of crisis because Mechanical organizational structures are more difficult to adapt to changes in the external environment. Therefore, for businesses, the organic organizational structure is considered a more suitable model in dealing with crises (Tutar, 2011: 34).

Tourism enterprises operate in a sensitive, fragile and dynamic environment. For this reason, Tourism enterprises try to maintain their existence with flexible organizational structures that are sensitive to environmental changes. Businesses that have insufficient knowledge and education, strictly protect traditional values and are closed to innovation generally do not have an organic and flexible structure. Such mechanical and rigid organizational structures are among the main reasons for crises arising from the organizational structure. On the other hand, hotel businesses that have a creative organizational structure that is flexible, open to innovations and encourages knowledge sharing can perceive risks that arise or are likely to arise in the external environment in advance and develop appropriate strategies (Akıncı et al, 2012: 83).

In the emergence of crises within tourism enterprises, various factors related to organizational structure play a significant role. Among these factors are employee dissatisfaction and low motivation, frequent errors in decision-making and implementation processes, an overly centralized management approach and deficiencies in coordination within the organizational structure. Additionally, high employee absenteeism and turnover, unclear organizational goals and workplace stress are significant factors that can trigger crises. Furthermore, deficiencies in creativity and innovation, communication gaps between employees and employers and overly narrow or broad scopes of control are among the crisis-inducing elements originating from organizational structure (Garda&Garaçor, 2015: 904).

***Figure 8**: Organizational Structure–Related Causes of Crises in Tourism Enterprises*

Source: The figure was prepared by the author based on a literature review and explanations of the topic

As seen in Figure 9, the rigidity of the organizational structure, communication deficiencies and low employee motivation are the main factors that accelerate the emergence of crises in tourism businesses. Therefore, it is critical that the organizational structure is designed to be flexible, open to innovation and to support effective communication. Such a structure contributes to tourism enter-

prises to develop resilience to crises and adapt quickly to environmental changes. On the other hand, organizational structures that are mechanical, rigid and have weak coordination increase the likelihood of crisis. This negatively affects the operational performance, service quality and competitiveness of the business.

6. CONCLUSION

International and national crises negatively affect the tourism sector by reducing individuals' earnings and tourist expenditures. Therefore, crises cause serious disruptions in the activities of tourism businesses. The fact that tourism demand is very elastic makes the sector highly vulnerable to external shocks. Therefore, wars, environmental and technological disasters, terrorist incidents, financial crises and epidemics can affect the sector rapidly and seriously. In addition, touristic demand varies depending on people's income level, the distance of the destination, security conditions, service and product prices and individual preferences and tastes. Therefore, demand elasticity is higher compared to other sectors. This high flexibility makes the tourism sector more vulnerable to both internal and external crises.

Developments that can plunge a business operating in the tourism sector into crisis stem from both internal and external factors. External factors are factors that are largely outside the control of the business, such as natural disasters, financial crises, uncertainty, environmental and technological disasters, competition, political and legal regulations and innovations. Internal crises that cause crises in the tourism sector are problems arising from the organizational structure of accommodation businesses or the services they provide. The internal factors causing the crisis are mostly factors within the company's control, stemming from the organization, management, managers, personnel, budget, and technical equipment

This study has investigated the crisis phenomenon in the tourism sector and the reasons for the emergence of crises. Theoretical studies reveal that external crises have significant effects on the tourism sector. Natural disasters, epidemics, economic fluctuations, political instability and environmental threats reduce tourism demand and cause revenue losses. This situation also damages the reputation of the destinations. Internal crises also pose a significant risk to tourism businesses. Inadequacies in service quality, low competence of staff, operational errors and security vulnerabilities are the main causes of these crises. Such problems can weaken the performance of the business by reducing

customer satisfaction.

Additionally, the way businesses are organized plays a critical role in the emergence and management of crises. Rigid, hierarchical and poorly coordinated structures limit organizations' capacity to respond quickly and effectively to unexpected events. On the other hand, organizational structures based on flexible, innovative and strong communication increase the resilience of the business. These structures help reduce risks by improving the ability to adapt. Human resources-related issues such as low employee motivation, high staff turnover, absenteeism and poor internal communication further increase internal vulnerabilities.

The study reveals that crises in the tourism sector have a multifaceted nature and stem from both external shocks and internal weaknesses specific to the sector. Therefore, effective crisis management in this sector requires an integrated approach that prioritizes a culture of flexibility, innovation and resilience and addresses both structural and operational vulnerabilities.

Tourism businesses can mitigate the negative impacts of crises by strengthening their organizational adaptability, implementing strategic crisis management and prioritizing proactive risk identification. These methods can help businesses ensure operational continuity and maintain long-term sustainability in a highly dynamic and fragile sector. Therefore, policy makers, managers and stakeholders should not ignore the importance of comprehensive risk management and strategic crisis management in order to support the stability and sustainable growth of tourism businesses at global and national levels.

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CHAPTER 2

REFLECTIONS OF CERAMIC AND GLAZE TECHNIQUES ON JEWELRY DESIGN: THE CASE OF PETER HOOGEBOOM

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1. INTRODUCTION

Ceramics represent one of the oldest forms of expression in human history. Ceramic objects are created by mixing earthen materials with water to form a clay body, which is then shaped and fired at specific temperatures to ensure durability and usability. In early periods, ceramic products were primarily employed for utilitarian purposes, such as plates, bowls, and vessels that facilitated daily life. Over time, their applications expanded in response to evolving societal conditions and needs. With technological advancement and its profound impact on human life, ceramics have become an essential material in both architectural and industrial production. At the same time, ceramics have persisted as a representational medium for the societies in which they are produced, reflecting cultural aesthetic values, belief systems, and artistic paradigms.

In terms of material composition, ceramics consist primarily of clay, quartz, and feldspar. The precise proportions of these constituents, firing temperatures, and applied techniques directly influence the physical properties and surface

characteristics of the final work. While industrial production typically follows standardized recipes, artistic practices allow for a significantly greater degree of experimentation and control. Each distinct approach applied to the material results in variations in the final outcome, thereby contributing to its authenticity and uniqueness. Consequently, the integration of ceramic materials across various interdisciplinary fields plays a significant role in enhancing the originality of contemporary artistic production.

Within this context, contemporary jewelry design can be considered an interdisciplinary field in which material, surface, and artistic expression are articulated through ceramic and glazing techniques. The incorporation of ceramics and glazes into jewelry design not only enables technical and material diversity but also facilitates shifts and transformations in aesthetic perception.

Numerous contemporary jewelry designers have explored the possibilities of ceramic materials in their practice. When used as a primary material, ceramics challenge the traditional dominance of precious metals in jewelry and goldsmithing, introducing a more conceptual and sculptural approach to jewelry design. Among these artists, Peter Hoogeboom was selected for this study due to his innovative use of ceramic materials and his sophisticated integration of ceramic–metal relationships. The artist's works are examined within the framework of material innovation, technique, and design principles.

2. CERAMICS

In this section, ceramics and ceramic glazes are examined, as these materials constitute the primary medium of Hoogeboom's artistic practice. According to Erman (2012, p. 19), ceramic production is regarded as a reflection of humanity's inherent desire for expression, with its primary material defined as water-resistant clay or earthen soil. Much like the earliest cave paintings, early humans combined the fundamental elements of their natural environment—water and earth—to create a workable clay body. This material was shaped and subsequently subjected to thermal processes in order to ensure its permanence and structural integrity.

The historical continuity of ceramics underscores its enduring significance in human civilization. Today, a substantial portion of utilitarian objects is composed of ceramic materials. Beyond fields in which ceramics are traditionally viewed as functional—such as sculpture, architecture, and industrial design—the medium is increasingly integrated into diverse disciplines, inclu-

ding textiles, painting, and contemporary jewelry design.

2.1. Ceramic Glazes

Ceramic glazes are substances applied to ceramic surfaces that, when fired at high temperatures, undergo physico-chemical changes to form a vitreous, protective, decorative, and hygienic coating. The glaze layers covering ceramic surfaces provide both aesthetic and functional value through the distinct visual effects they generate. *As defined by Yıldırım and Tazeoğlu Filiz (2023, p. 274), glaze is a silica-based material utilized to coat ceramic, tile, or porcelain bodies.*

Glazes are typically applied to bisque-fired ceramic bodies and subsequently fired in kilns at specific temperature ranges. During this process, the glaze melts and fuses with the body, creating a glass-like surface. The purpose of glazing extends beyond mere visual enhancement; it also seals the porous ceramic surface, rendering it impermeable to liquids and external contaminants. Consequently, glazing contributes not only to the visual enrichment of the piece but also to its functional performance and long-term durability.

3. PETER HOOGEBOOM

Peter Hoogeboom continues his artistic practice in Amsterdam, the Netherlands, having completed his formal education in the Jewelry Design Department at the Gerrit Rietveld Academy (URL 1). He integrates his expertise in jewelry design with the extensive formal and expressive possibilities offered by ceramic materials. Hoogeboom draws inspiration from the earliest ceramic artifacts in human history and reinterprets forms of adornment that addressed humanity's need for bodily decoration in prehistoric periods, translating these references into a contemporary design language.

By emphasizing the historical use of terracotta beads in bodily ornamentation, the artist has developed numerous jewelry works through contemporary reinterpretation. In order to reduce the inherent mass and weight of ceramic materials during the production process, Hoogeboom frequently employs slip-casting techniques. Particular attention is given to the functionality and ergonomics of the jewelry for the wearer; accordingly, many of his designs are produced as hollow, lightweight forms while maintaining structural durability. His compositions often rely on the repetition of modular units and the assembly of multiplied elements into cohesive structures. As a result, his works are pre-

sented not merely as ceramic objects but as wearable and functional art pieces.

Designed in accordance with human anatomy and ergonomic principles, Hoogeboom's jewelry is characterized by a contemporary design approach. While conventional jewelry is typically constructed through the assembly of metal components, Hoogeboom demonstrates that functional jewelry can also be created using a rigid material such as ceramics. Through the application of glaze techniques to ceramic and porcelain surfaces, he introduces color, texture, and vitreous surface qualities to his designs. In this context, traditional materials such as silver are intentionally positioned in a secondary role, functioning primarily as supportive and connecting elements for the ceramic forms.

The artist incorporates multiple design principles through the repetition of forms and subtle variations in color tones. In the construction of fastening systems, durability is prioritized, and silver-commonly used in jewelry production-is employed for clasps and connecting components. This material integration ensures that the jewelry maintains ergonomic integrity, usability, and functional performance, allowing the pieces to be worn comfortably.

Figure 1: Peter Hoogeboom, Finger Cot Hulu Green, porcelain and silver, diameter: 26 cm, height: 5.5 cm, 2015.

As observed in Figure 1, the jewelry form is articulated through the rhythmic repetition and assembly of modular ceramic units. Structured according to the fundamental principles of rhythm and unity, this piece consists of hollow ceramic elements arranged in a precise sequence. The dynamic interplay

between void and mass within these units amplifies the emphasis on repetition, contributing to the overall visual cadence and structural balance of the design.

The porcelain body, treated with sophisticated glazing techniques, produces nuanced color transitions, tonal variations, and vitreous surface textures. Although the individual units maintain a consistent formal morphology, subtle variations in the glaze application introduce visual differentiation, thereby reinforcing the authenticity and singular character of the work.

The necklace, which harmonizes with the anatomical curvature of the neck, demonstrates superior ergonomic qualities through its alignment with the human form. Silver is utilized as a supportive medium within the connection and fastening systems, enhancing the structural integrity of the piece. Within this visual hierarchy, the metallic components are intentionally relegated to a secondary role, while the ceramic and glazed surfaces serve as the primary medium of artistic and conceptual expression.

Figure 2: Peter Hoogeboom, Blue Lantern, porcelain and silver, diameter: 24 cm, height: 6.5 cm, 2015.

As observed in Figure 2, a necklace design created through the repetition and assembly of modular porcelain units is observed. Designed in accordance with the principles of rhythm, unity, and repetition, this necklace consists of hollow ceramic units with circular forms arranged sequentially in three rows. Through this arrangement, a rhythmic structure is established across the surface. In the central row, contact occurs between the upper and lower units, allowing the relationship between void and mass to be conveyed in a natural

manner. Consequently, the articulation of voids strengthens the volumetric perception of the jewelry.

The blue-toned glazes applied to the porcelain surfaces create a visually layered effect through their glass-like textures and light reflections. Variations in tonal values among the units, together with irregularities in their forms, bring the uniqueness of the design to the forefront. The circular configuration of the necklace is constructed in harmony with the anatomy of the neck, thereby supporting the ergonomic and wearable qualities of the piece.

Silver is employed as an auxiliary material in the connection and fastening systems. The chain, commonly used as a suspension element in jewelry design, functions in this work as a binding component that connects and stabilizes the porcelain units. Consequently, the chain and metal clasp system are deliberately positioned in the background of the design hierarchy, allowing the ceramic and glazed surfaces to serve as the primary medium of expression.

Figure 3: Peter Hoogeboom, Mokume Gane Sweet William, porcelain, silver, and synthetic rubber, diameter: 25 cm, height: 4.5 cm, 2015.

As observed in Figure 3, the necklace design is articulated through the rhythmic assembly of modular porcelain units. Structured according to the fundamental principles of rhythm, unity, and repetition, the piece features solid, semi-spherical ceramic elements arranged in a precise sequence, generating a consistent rhythmic cadence across its surface.

The porcelain surfaces exhibit chromatic effects reminiscent of the Mokume Gane technique a traditional Japanese metalworking method involving the lamination and fusion of disparate non-ferrous metal layers. By titling the work Mokume Gane Sweet William, the artist explicitly acknowledges that his tech-

nical inspiration stems from this intricate metal ornamentation process. Hoogeboom masterfully reinterprets this metal-based aesthetic onto ceramic surfaces, translating it into a contemporary mode of expression through nuanced color transitions and textured surface variations. The subtle shifts in tonal values and textures among the individual units emphasize the singular character and authenticity of the design while maintaining a cohesive formal unity.

The circular silhouette of the necklace is engineered to harmonize with the anatomical contours of the neck, ensuring superior ergonomic and wearable functionality. Silver is utilized as an auxiliary medium for the connection and fastening systems, while synthetic rubber intermediaries provide essential flexibility between the ceramic modules, thereby enhancing the mobility and kinetic quality of the jewelry. Within this visual hierarchy, the metal and rubber components are intentionally relegated to a secondary role, allowing the ceramic and glazed surfaces to emerge as the primary medium of artistic and conceptual expression.

Figure 4: Peter Hoogeboom, Spanish Collar, ceramics, silver, and neodymium magnets, diameter: 23 cm, height: 7 cm, 2015.

As observed in Figure 4, the necklace design consists of five tiers formed through the rhythmic repetition and assembly of modular ceramic units. Structured in accordance with the principles of rhythm, unity, and emphasis, the piece incorporates perforated ceramic elements with circular forms. The dense and

sequential arrangement of these units demonstrates a clear dominance of mass over void, establishing a hierarchical structure that contributes to the sculptural quality of the jewelry.

The light-toned glazes applied to the ceramic surfaces contribute to a homogeneous visual cohesion across the piece. Subtle variations among the individual units emphasize the handcrafted nature and singular character of the work.

Silver is employed in the centrally positioned fastening system, where a connection mechanism utilizing neodymium magnets allows the piece to be easily worn and removed. The use of magnets within the clasp system constitutes an important functional feature, particularly in relation to the scale and volume of this collar design.

In this context, the metallic components and the magnetic system function as structural and functional elements positioned in the background of the visual hierarchy. Consequently, the ceramic units are established as the primary medium of formal and artistic expression within the design.

Within the scope of this study, the role of ceramic materials and glazing techniques in contemporary jewelry design has been examined through the interdisciplinary practice of Peter Hoogeboom. Throughout history, ceramics have been recognized as a medium encompassing both functional and decorative production. Hoogeboom's jewelry designs demonstrate that ceramics can transcend their traditional utilitarian boundaries and be transformed into wearable and functional art objects.

The analyzed works reveal that fundamental design principles—such as rhythm, unity, mass–void relationships, emphasis, and spatial articulation—are effectively articulated in forms created through the repetition and assembly of modular ceramic units. Glazing techniques applied to these surfaces enhance the visual qualities of the jewelry through color transitions, textural diversity, and vitreous surface effects. The repetition of these units ensures that each design retains a sense of originality and singular character. Notably, the designs inspired by the Mokume Gane technique illustrate how ceramic surfaces can be reinterpreted through an aesthetic traditionally associated with metalworking.

In Hoogeboom's oeuvre, metallic materials function primarily as auxiliary elements within connection, fastening, and structural support systems, without visually dominating the ceramic components. The integration of materials such as silver, synthetic rubber, and magnets supports the overall functionality of the jewelry while allowing the ceramic surfaces to remain the primary medium of artistic expression. This approach offers an alternative perspective to the material

limitations traditionally associated with metal-centered goldsmithing practices.

In conclusion, Peter Hoogeboom's jewelry designs demonstrate that ceramic materials and glazing techniques should be regarded not merely as technical applications, but as significant artistic and conceptual means of expression. Through an interdisciplinary production approach, the artist presents alternative examples of ceramic–metal integration that expand material diversity within the field. In this context, Hoogeboom's work provides important examples that render the functional and expressive potential of ceramic materials visible within contemporary jewelry design.

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Figure 3: Peter Hoogeboom, Mokume Gane Sweet William, porcelain, silver, and synthetic rubber, diameter: 25 cm, height: 4.5 cm, 2015.
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Figure 4: Peter Hoogeboom, Spanish Collar, ceramics, silver, and neodymium mag-

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CHAPTER 3

ISSUES CREATED BY PLATFORM WORK FROM THE PERSPECTIVE OF SOCIAL SECURITY LAW AND ITS EVALUATION FROM THE PERSPECTIVE OF SOCIAL POLICY

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INTRODUCTION

The acceleration of digitalization has significantly transformed working relationships. In particular, developments in information and communication technologies have changed how labour is provided, giving rise to new and atypical working models that exist outside traditional employment relationships. One of the most prominent manifestations of this transformation is the form of work conducted through digital platforms, referred to as "platform work" or "platform-based work." Although platform work provides flexibility and accessibility in the labour market, it also raises important questions about workers' legal status and social security rights.

Platform work lacks a clear position within existing labour and social security law regulations because the relationship between the employer and worker is mediated digitally and structured outside the traditional employment contract

framework. In platform contracts, workers are usually classified as independent contractors or self-employed, creating a mismatch between their actual working conditions and their legal classification. However, because the social security system is mainly based on continuous and dependent employment, it fails to adequately cover atypical forms of work like platform work. Uncertainties about platform workers' insurance status, premium obligations, and protection against social risks have emerged, requiring re-examination in light of fundamental social security principles. Particularly in platform work, where the element of dependency continues to exist implicitly, the exclusion of workers from employee status significantly limits their access to social security protection.

In this context, platform work has significant consequences not only in terms of individual rights but also in terms of social policy. The proliferation of precarious and intermittent forms of work, the weakening of income security, and difficulties in accessing social protection mechanisms make platform workers more vulnerable to social risks. The goal of protecting disadvantaged groups and reducing social risks, which is the fundamental objective of social policy, makes the relationship between platform work and the social security system even more important.

The study is based on the fundamental assumption that platform work does not provide adequate and comprehensive social security protection within the existing labour and social security law regulations, and that this situation creates a structural gap in terms of social policy. The study argues that excluding platform workers from employee status effectively prevents them from exercising their social security rights and that this situation is incompatible with the principle of the social state. Within this framework, the conceptual and structural characteristics of platform work will first be addressed, followed by an examination of the consequences of the legal status of platform workers in terms of social security law. Finally, the inadequacy of existing protection mechanisms will be assessed from a social policy perspective, and general-level solutions will be proposed.

1. SCOPE AND METHODOLOGY OF THE STUDY

This study focuses on issues arising from work conducted through digital platforms from the perspective of social security law. Specifically, it examines forms of platform work in which labour provision is continuous and elements of actual dependency are evident, rather than covering all types of platform work. Within this scope, the study analyzes how the concept of "worker" in labour

law and the status of "insured person" in social security law are shaped in the context of platform work, based on current legislation and doctrinal opinions.

The study adopts a normative and doctrinal analysis approach. Relevant constitutional regulations, as well as provisions of current legislation—primarily Labour Law No. 4857 and Social Insurance and General Health Insurance Law No. 5510—have been examined, and academic opinions on the subject have been evaluated. The study aims to reveal the current state of positive law and does not include a detailed comparative legal analysis or a comprehensive analysis of court decisions. The social policy dimension is addressed through general assessments within the framework of the social state principle and the right to social security.

2. THE CONCEPT OF PLATFORM WORK AND ITS GENERAL CHARACTERISTICS

2.1. Definition and Types of Platform Work

Platform work is a flexible form of work in which the labour market supply and demand are brought together through the opportunities offered by digital technologies (Arslantaş, 2024: 37), a digital platform plays a central role as an intermediary in the performance of work, and individuals share their goods, experience, or services with each other for a fee or free of charge (Kurt and Aydın, 2025: 44; Görmüş, 2020; Beytar, 2020: 241) and where the working relationship is largely established online. Platforms are also digital networks used for collaboration in commercial activities such as the provision of goods and services, social media-like commercial transactions, or voluntary activities (Belgin Boyacı, 2020: 5).

In platform work, the concepts of platform worker, customer, and platform are used instead of the traditional concepts of worker, employer, and workplace (Bakın, 2023: 390; Tokol, 2021: 37). In this model, the platform provides the software, algorithms, and data infrastructure that organizes the work; the actual work is performed by individuals registered on the platform, who are often contractually classified as independent contractors. Platform work exhibits a structure that differs from the traditional employer-employee relationship. In this type of work, the legal nature of the relationship between the parties often remains unclear. This uncertainty has significant consequences, particularly in terms of job security, wages, working hours, social

security, and union rights (Bakın, 2023: 393-402). Digital intermediation is decisive in establishing and conducting the employment relationship in platform work, and platforms can exercise actual control over job distribution, remuneration, and performance through algorithms. Therefore, in determining the legal nature of the relationship between the platform and the worker, the actual functioning of the relationship should be taken as a basis rather than contractual characterization.

Platforms are subject to certain classifications based on different criteria. The distinction generally accepted in the literature is based on the nature of the work performed through the platform. Accordingly, platform work is classified as online and offline (location-based) platform work. In online platform work, the work is performed entirely in a digital environment and is offered regardless of geographical location. In offline platform work, the work is performed in a physical location; however, the organization and supervision of the work is provided through a digital platform. Platforms operating in the delivery, transportation, and personal services sectors, in particular, are common examples of offline platform work. In such work, the platform's authority to determine working hours, evaluate performance, and restrict access to services necessitates a reassessment of the relationship between workers and the platform in terms of dependency. In this respect, the distinction between types of platform work is also important in determining insurance status under social security law.

Platforms also include those that provide access to personal data and private content (LinkedIn, Facebook), those that provide access to information or content (TripAdvisor, YouTube, Google, Google Maps), those that provide access to goods or services (Amazon, Airbnb, Uber, Booking.com), those accessing labour, expertise, or intellectual skills (Upwork, Task Rabbit), and those accessing money and capital (Gofundme, Kickstarter), as well as payment systems (Bitcoin, Mastercard, PayPal) (Bakın, 2023: 389; Strowel and Vergote, 2019: 11). Another classification is as follows: platform work; web-based and location-based according to the type of work; transportation, distribution, home services, care services according to the field of activity; and competition method, first-come-first-served method, and selection method according to the task assignment method (Arslantaş, 2024; 43-51; Küçük, 2023: 73-77; ILO, 2019: 5, Schmidt, 2017: 7). Eurofund, on the other hand, categorizes platform work into different types based on the nature of the work, where and how the work is performed, and the actor that is decisive in the organization of the work;

within this framework, it classifies platform work under ten different job types[1] (Bakın, 2023: 390; Eurofund, 2018: 5). The ILO classification, on the other hand, divides work into two groups based on the type of work: web-based work and location-based work (Arslantaş, 2024: 42; Kurt and Aydın, 2024: 48-51; ILO, 2021a:74-77).

While platform work offers advantages[2] such as flexibility and accessibility, it also presents a structure that challenges existing labour law concepts regarding the legal status and protection of workers[3]. Therefore, it is crucial to reassess the role of platforms as employers and the legal position of platform workers in light of the digital reality of work, using both judicial precedents and legal regulations

1 Platform work is categorized into different types based on whether the work is performed on-site or online, the skill level required, and the key actor determining the organization of the work. In this context, routine jobs determined by the customer on-site platforms include low-skilled activities such as cleaning, transportation, and minor repairs, while routine jobs determined by the platform focus on delivery and courier services, making the platform's employer-like role more prominent. Medium-skilled jobs on in-person platforms consist of maintenance and technical services determined by the customer, as well as models initiated by the worker that offer relatively more autonomous working opportunities. On online platforms, medium-skilled click-based jobs are characterized by intensive algorithmic control and piece-rate remuneration. Highly skilled platform jobs encompass professional services carried out on-site or online, determined by the customer or platform; as the platform's determinacy increases, elements of dependency become more visible. Competition-based skilled jobs on online platforms are subject to criticism in terms of labour law and social policy because they increase the risk of unpaid labour..

2 Platform providers offer easy access to highly skilled workers on a global scale through digital platforms. Software enables the monitoring and management of labour supply and demand. However, due to the uncertain legal status of platforms, they do not assume responsibility for issues such as job security, insurance, and social rights. This reduces transaction costs. Customers using the platform can quickly access the desired skills from a large and competitive pool of workers and make more informed decisions when selecting workers thanks to reputation systems. From the workers' perspective, platform work offers advantages such as income generation, temporal and spatial flexibility, and autonomy; it facilitates the participation of disadvantaged groups, particularly women, young people, and people with disabilities, in the labour market. Furthermore, since remuneration in platform work is more task-based and objective, the risk of discrimination may be reduced (Arslantaş, 2024: 55-58).

3 In this sense, platform work has a heterogeneous structure and, in addition to advantages such as flexibility and global job opportunities, also includes disadvantages such as job insecurity, income instability, constant competition, social isolation, and psychological pressure. While platforms burden workers with occupational health, safety, training, and equipment costs, tasks are often isolated and demand-driven, and workers' performance is constantly rated, which increases stress and pressure. Workers may face ethical issues and the risk of low wages due to a lack of information about the scope, purpose, or identity of the customer. Furthermore, platforms limit collective organization and the sense of belonging, making it difficult to assert rights, and the risk of indirect discrimination may also persist (Arslantaş, 2024: 58-62). For different explanations of the advantages and disadvantages, see Kurt and Aydın, 2024: 58-65.

to eliminate uncertainty in this area.

2.2. Main Features of the Platform Work

One of the most distinctive features of platform work is that the working relationship is flexible and intermittent. Platform workers often do not commit to a specific working time; when and to what extent the work is done is largely determined by the job opportunities offered by the platform. While this provides workers with flexibility in terms of time, it also leads to a decline in income continuity and predictability.

Another main feature of platform work is that the element of dependency is often hidden. Platforms can monitor workers' activities through algorithms, evaluate their performance, and restrict their access to work based on specific criteria. Such mechanisms demonstrate that the management and control powers traditionally held by employers in conventional employment relationships are being exercised in a digital form. Despite this, platform workers are often contractually classified by platforms as "freelancers", thereby excluding them from employee status.

Another distinguishing feature of platform work is that risk is largely left to the worker. Job continuity, income level, and protection against social risks are often left to the individual responsibility of workers. This situation makes it difficult for platform workers to access the social security system and places them in a more vulnerable position in the face of social risks. In particular, the failure to provide adequate social security protection against risks such as work accidents, illness, and old age brings the social policy dimension of platform work to the fore.

Platform work offers significant employment opportunities for groups facing difficulties accessing the labour market, such as rural communities, people with disabilities, migrants, and refugees, due to its low capital requirements and the fact that it can be carried out using simple tools like an internet connection. This working model allows workers to balance work and family life by providing temporal and spatial flexibility, making it an attractive option, especially for women and young people. While the majority of platform workers are concentrated in the delivery and passenger transport sectors, online platforms also offer jobs in software development, content production, writing, and translation. A large proportion of workers use platforms as a source of additional income; those who work on platforms as their main source of income are generally concentrated in location-based sectors. Although platform work sometimes has

disadvantages in terms of earnings due to unpaid periods and intense competition, in some cases it can generate higher earnings than traditional jobs. Furthermore, job distribution, wage calculation, and performance tracking are carried out through algorithms; while these methods increase efficiency, they also create control and psychological pressure on workers, affecting decent work practices (ILO, 2025: 19-22).

2.3. The importance of Platform Work in Terms of Social Security

The specified characteristics of platform work give rise to significant and multifaceted consequences from the perspective of social security law. Traditional social security systems are largely designed around continuous and dependent employment relationships, and therefore platform work, defined as flexible and atypical forms of work, carries the risk of falling outside the scope of existing social security regimes (De Stefano, 2016). In particular, the legal uncertainty surrounding the insurance status of platform workers raises the question of who is responsible for paying premiums and to what extent (Berg, 2016). This uncertainty prevents workers from adequately benefiting from basic social security rights such as accident, sickness, unemployment, or old-age benefits.

International examples illustrate this situation. In European Union countries, a large proportion of platform workers are still classified as independent contractors and therefore have limited social security coverage (Eurofund, 2018). Studies conducted on Uber[4] and Deliveroo drivers in the UK have revealed the need to relax existing legislation or create a new category to enable these workers to benefit from social security rights. In the US, platform workers defined as "gig workers" have severely limited access to health insurance and unemployment insurance due to their independent contractor status. Some European countries, such as Italy and France[5], have begun to introduce regulations that will include certain platform workers in the mandatory social security system, and these initiatives are considered pioneering examples in terms of integrating platform work into the social security system. In this context, platform work emerges as an area that needs to be reevaluated in terms of the principles of inclusiveness and equality in social security law. The exclusion of platform workers from the social security system not only leads to individual rights losses but also undermines the principle of socialization of risks (De Stefano, 2016). To ensure the applicability

4 See. Kurt ve Aydın, 2024: 70; Marique ve Marique, 2018.

5 See the example of France. Kurt ve Aydın, 2024: 67-69.

of the social state principle in the face of current working patterns, the legal status of platform workers must be clarified and integrated into the social security system (Berg, 2016). In this context, social policy makers and legislators must modernize social security regimes and redesign them to cover flexible working arrangements, taking into account the growth of the platform economy and the transformation of the labour market (Eurofund, 2018).

Platform work, as an increasingly widespread phenomenon in labour markets, necessitates a reassessment in the fields of social security law and social policy. This reassessment is crucial both for protecting workers' fundamental social rights and for effectively socializing social risks. Updating legal regulations and adapting social security systems to cover flexible forms of work will contribute to the continuation of the social state principle in line with contemporary forms of work. Therefore, addressing the legal and social security dimensions of platform work in a holistic manner is of critical importance in terms of both protecting individual rights and ensuring the economic and social stability of society.

From Turkey's perspective, platform work creates similar uncertainties for the social security system. The current social security regime is primarily based on continuous and dependent employment and is not fully designed to cover short-term and flexible platform jobs. Since the majority of platform workers are classified by platforms as independent contractors or self-employed persons, they can only benefit from rights such as unemployment, work accident, and occupational disease insurance to a limited extent. Furthermore, premium obligations are often borne by the worker, and the social security contribution of platform providers remains limited. This situation demonstrates that platform workers in Turkey face similar risks to international examples in terms of social security, necessitating the adaptation of the social state principle to contemporary working arrangements.

3. DISTINCTION BETWEEN EMPLOYEES AND SELF-EMPLOYED WORKERS AND ITS CONSEQUENCES IN TERMS OF SOCIAL SECURITY LAW

3.1. The concept of employee and independent worker

The legal status of platform workers has given rise to numerous debates, and various rulings have been issued regarding disputes in this regard. For example, the decision of the Istanbul Regional Court of Appeals, 50th Civil Chamber, dated April 20, 2022, numbered 2022/93 E and 2022/70 K, as well as the de-

cision of the 25th Civil Chamber, dated June 2, 2022, numbered 2022/1008 E and 2022/1818 K, can be cited as examples in this context (Kurt and Aydın, 2024: 65).

According to Labour Law No. 4857, an employee is defined as a person who works under an employment contract and undertakes to perform the work specified by the employer (Labour Law, Article 2). The most fundamental characteristic of an employee is that they act under the employer's orders and instructions, reflecting the existence of a dependency relationship. In this context, an employee does not merely provide labor; they work under the employer's management and supervision, following the employer's directions. This characteristic necessitates the inclusion of employees in the social security system and the employer's obligation to pay social security premiums.

However, whether platform workers fit the classical definition of an employee remains a matter of debate. While platform workers may partially determine their own schedules and work arrangements without being subject to detailed instructions from the platform, elements of actual dependency often persist. Furthermore, a key requirement for being recognized as an employee is the existence of an employment contract. From this perspective, the employment contract remains a fundamental element in establishing employee status (Aydın and Ezer, 2025: 118; Sümer, 2003: 17).

A self-employed worker (commonly referred to as a "freelancer") is an individual who operates their own business independently, determining working hours, methods, and workplaces by their own volition. They bear their own risks and earn income based on the outcome of their work. In terms of social security, independent workers are generally classified under the 4/b insured category of the Social Insurance and General Health Insurance Law No. 5510, with contributions paid by the individual themselves. Although most platform workers are legally classified as independent workers, the actual conditions often contradict this classification. For instance, workflow organization, working hours, and performance criteria are largely determined by platform algorithms, forcing workers to comply with platform rules. This creates a dependency that does not fully align with the legal definition of self-employment, highlighting a mismatch between legal status and actual circumstances. In some cases, the term "worker-like" is also used as a third category for platform workers, reflecting their hybrid status (Arslantaş, 2024: 159-164; Beytar, 2022: 259-260).

Internationally, platform workers are considered employees under French, German, Spanish, US, UK, Dutch, and Swiss law, while rulings in New Zea-

land, Australia, and Turkey have sometimes recognized them as independent contractors (Kurt and Aydın, 2024: 67-73).

3.2. Status uncertainty and social security consequences in platform work

The inability to classify platform workers as employees or independent contractors is causing significant problems in the social security system. Platform workers who do not have employee status cannot benefit from the payment of social security contributions by their employer; even if they are considered independent contractors, their income levels are generally not sufficient to pay contributions. This situation prevents platform workers from receiving adequate protection against the risks of work accidents, illness, unemployment, and old age.

Furthermore, the uncertainty surrounding the insurance status of platform workers leads to a situation of "falling between the cracks" in the social security system. Workers who are not recognized as employees cannot be insured under Section 4/1-a, while being subject to Section 4/1-b as independent workers causes problems in terms of both the premium burden and the conditions for acquiring rights. This situation prevents the effective exercise of social security rights and creates inconsistencies with social policy objectives. Therefore, there is a need to reorganize the current system to cover flexible forms of employment. Otherwise, platform workers will be deprived of social security in the long term, and social inequalities will deepen.

3.3. Social policy approach

Platform work, as an increasingly common form of employment in the digitalizing world of work, raises various issues from both a legal and a social policy perspective. In particular, the distinction between employees and independent contractors plays a central role in assessing the working conditions of platform workers. This distinction is critical not only in terms of interpreting legislation but also in terms of workers' access to social security.

Platform work falls outside social protection systems that are based on traditional full-time and indefinite employment arrangements. Platform workers are exposed to mental and physical health risks and are more vulnerable than stand-

ard workers in terms of occupational safety and working conditions. The level of social protection varies depending on whether the worker's main source of income is platform work, the nature of the platform, and the level of the welfare state in the country where the work is performed. Research shows that the vast majority of platform workers do not have access to basic social rights such as health insurance, unemployment insurance, and pensions. This situation reveals that platform work reduces workers' level of social protection and increases insecurity (Bakın, 2023: 402-403).

Platform workers are generally a group that lacks income security, is unprotected against workplace accidents and occupational diseases, and is not included in the social security system. This situation renders platform workers more vulnerableto social risks and requires special attention in terms of social policy. The fundamental aim of social policy, namely the protection of disadvantaged groups and the reduction of social risks, must be reconsidered in the context of platform workers.

The proliferation of platform work also highlights the limitations of the existing social security system. As legislation is designed based on traditional employment models, platform workers are often excluded from this system and exposed to practices that are incompatible with social policy objectives. In this context, the debate over the distinction between employees and independent contractors is not merely a legal debate; it also necessitates the updating of social policy objectives and the development of new regulations appropriate for the digital economy.

Platform work offers a new perspective in terms of both the flexibilization of working life and the redistribution of social risks; this situation requires the legal and social policy dimensions to be addressed simultaneously. Protecting workers and ensuring their access to social security has become a fundamental priority for sustainable social policy in the digitalizing labour market.

4. THE ISSUE OF SOCIAL SECURITY PROTECTION IN PLATFORM WORK

4.1. The constitutional and legal foundations of the right to social security

The social security coverage of platform workers has serious shortcomings. Most platform workers are classified as independent contractors or self-employed workers and therefore lack access to basic social security rights such as health insurance, unemployment insurance, retirement, and workers' compen-

sation insurance. The pay-per-task model, unregistered work, and the exemption of platforms from contribution obligations further exacerbate this situation. Those who rely on platform work as their primary source of income are at greater risk than those who work for additional income.

Various social security conventions and recommendations adopted by the International Labour Organization (ILO) establish social protection principles that also cover platform and atypical work. The Social Security (Minimum Standards) Convention, 1952 (No. 102), provides governments with flexibility to apply the scope of protection to different groups, such as the economically active population or residents, and avoids defining protected persons solely in legal terms. Recommendation No. 202 of 2012 emphasizes the principle of social inclusion and envisages that workers in the informal economy should also benefit from social protection. The Work Injury Benefits Convention No. 121 of 1964 applies to all workers and apprentices in the public and private sectors and provides for optional or phased insurance for self-employed workers. The Convention No. 168 of 1988 provides for protection against unemployment but does not cover self-employed workers. The Convention No. 183 of 2000 on the Protection of Maternity covers female workers, but self-employed women are excluded from this coverage. While ILO conventions establish principles of social protection and inclusiveness, platform workers mostly have limited coverage due to the distinction between dependent and atypical work (ILO, 2019: 34-35).

Many countries are taking various measures to expand social security coverage; some provide protection by creating new employment categories, while others offer solutions through collective agreements or special social security funds. However, there are still shortcomings in terms of coverage, adequacy, and integration, and inconsistencies with the principles of universality and solidarity in social security systems. For example, in Italy, platform workers are provided full protection under the category of "organizationally dependent self-employed workers," while in Portugal, businesses that benefit significantly from the activities of independent workers are held responsible for social security contributions. In France, legislation has been implemented to include platform workers in work accident insurance coverage and provide additional social protection. In India, social security laws for platform workers provide for insurance and health benefits covering work accidents, death, and retirement. Furthermore, the Republic of Korea has included delivery and platform drivers in unemployment and maternity insurance. However, there are still shortcomings in terms of coverage, adequacy, and system integration, resulting in incon-

sistencies with the principles of universality and solidarity in social security systems (ILO, 2019: 79-82).

The right to social security is a fundamental right guaranteed for everyone under Article 60 of the Constitution and is a requirement of the principle of the social state. Social security functions as a system that aims to protect individuals against social risks such as illness, old age, unemployment, and work accidents. The fundamental purpose of the social security system is to provide economic and social security by socializing the risks faced by individuals. In this context, the ability of workers to benefit from social security is considered an important requirement from both an individual and a societal perspective.

4.2. Social Security Status of Platform Workers

The legal status of platform workers is a fundamental determinant that directly affects their access to social security protection. Traditional social security systems are largely based on permanent and dependent employment relationships; therefore, platform workers who do not have employee status are deprived of the right to have premiums paid by their employer, while those who are considered independent contractors are responsible for paying their own premiums. Most platform workers' income levels are not sufficient to cover social security contributions on a regular basis, effectively leaving them without social security. From a social policy perspective, this situation affects not only individual rights but also the distribution of social risks. One of the fundamental principles of the welfare state is the socialization of risks and ensuring equal access to social protection mechanisms for citizens. The current status uncertainty and fragmented contribution obligations of platform workers weaken this principle and deepen inequalities. This group, which lacks income security and cannot cover health and unemployment risks, experiences the risk of social exclusion created by modern forms of work.

The unique organizational structure of the platform economy also creates new areas of responsibility in terms of social policy. In jobs conducted through platforms, the determination of workflow, duration, performance, and oversight by algorithms makes it legally debatable to exclude workers from employee status, while also complicating the application of social security protection. From a social policy perspective, this form of work is incompatible with traditional social insurance models and creates gaps in protection. Therefore, including platform workers in the social security system and clarifying their legal

status is critical both in terms of protecting individual rights and maintaining social equality, social solidarity, and decent work principles in the face of modern forms of work. From a social policy perspective, this situation necessitates a rethinking of social security reforms and new regulations to encompass the flexible and atypical working forms of the platform economy. In this context, a balance must be struck between the protective goals of the welfare state and the demands of the digitalizing labour market.

4.3. Social Security Coverage Exclusions and Risks

Platform work is becoming increasingly widespread as a flexible and independent form of employment, but this situation poses serious challenges for social security systems. The limited or uncertain social security coverage of platform workers makes them vulnerable to economic and social risks. This vulnerability not only causes individual hardship but also has negative consequences in terms of social policy objectives and the principles of social solidarity.

Income insecurity is one of the most fundamental risks of platform work. The earnings of platform workers are directly dependent on the amount of work, demand intensity, and opportunities offered by the platform. This income fluctuation prevents the provision of regular economic security and leaves workers vulnerable to sudden income losses. From a social policy perspective, income insecurity negatively affects the goals of combating poverty and economic stability, weakening the social integration of vulnerable groups. The risks of workplace accidents and occupational diseases also create a serious protection gap. Physical accidents occurring during work are not covered by social security for platform workers who do not have employee status or whose premium payments are insufficient. This situation jeopardizes individual health and safety while also causing the social costs of workplace accidents and occupational diseases to be concentrated on workers.

From a social policy perspective, this lack of protection reduces the effectiveness of the principles of social risk sharing and solidarity and necessitates a rethinking of occupational health and safety standards in the context of the platform economy. The risks of illness and old age threaten the long-term economic security of platform workers. Workers who are not included in the social security system or who cannot pay sufficient premiums are unable to benefit from sickness, retirement, and other social rights. When evaluated in the con-

text of social policy, this deficiency conflicts with the goals of inclusiveness and equality of the social security system and contributes to the deepening of social inequalities. The risk of social exclusion is also an important dimension of platform work. Workers deprived of social security cannot adequately benefit from social rights and the support mechanisms offered by the state. This situation not only causes a loss of rights at the individual level but also weakens the functioning of social integration and solidarity mechanisms in society as a whole. This situation constitutes a violation of the principle of socialization of risks, highlighting the necessity for social security reforms tailored to the digitalizing labour markets. Consequently, the flexible and atypical nature of platform work creates multidimensional risks for workers excluded from social security coverage. These vulnerabilities, ranging from income insecurity to health and retirement risks, and from social exclusion to social inequalities, are important not only in terms of protecting individual rights but also in terms of protecting the fundamental principles of the welfare state. Therefore, the inclusion of platform workers in the social security system should be considered a critical social policy goal in terms of both individual welfare and social solidarity.

CONCLUSION AND RECOMMENDATIONS

The spread of digitalization and the platform economy has fundamentally transformed working relationships and created significant problems in the social security system with the distinction between employees and independent workers. Platform workers are in a vulnerable position in the face of income insecurity and social risks due to legal status uncertainty and exclusion from social security coverage. This situation poses a serious problem in terms of the applicability of the social state principle and the right to social security to current forms of work.

The problems created by platform work in terms of social security law and social policy can be addressed through various solutions. First, rather than narrowly interpreting the distinction between employees and independent contractors, the legal status of platform workers should be determined by taking into account the actual elements of dependency. This approach will facilitate the inclusion of workers in the social security system and reduce existing gaps.

Hybrid insurance models can be developed to integrate platform workers into the social security system. These models can strike a balance between flexible working arrangements and social security rights by providing for premium

payments to be made partly by the platform and partly by the worker, depending on the worker' s income level and working hours. This will enable platform workers to maintain their flexibility while also benefiting from basic social security rights.

From a social policy perspective, special support programs can be created for platform workers. Additional protection mechanisms provided by the state in areas such as income insecurity, occupational accident risk, and old age will ensure that platform workers are in a safer position against social risks. Such regulations will strengthen the adaptation of the social state principle to current working patterns and contribute to reducing social inequalities.

Cooperation mechanisms can be established between platform operators and social security institutions. Providing the technical and legal infrastructure for platforms to regularly pay their employees' contributions and monitor their social security rights will increase the system's efficiency and facilitate the socialization of risks.

The analysis presented in the study shows that platform work is not sufficiently protected under current legislation and creates a structural gap in terms of social policy. The integration of platform workers into the social security system is important not only in terms of protecting individual rights, but also in terms of sharing social risks and protecting disadvantaged groups. Flexible interpretation of the concept of worker, hybrid insurance models, and state-supported social policy measures will make it possible to maintain the flexibility advantage offered by platform work while ensuring balance in terms of social security and social risks.

In conclusion, the relationship between platform work and social security is a current issue that needs to be reevaluated from both labour law and social policy perspectives. By revealing the effects of the digitalization of working life on the social security system, this study serves as a fundamental guide for policymakers and legal practitioners.

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CHAPTER 4

USER-CENTERED PERFORMANCE EVALUATION OF BEEKEEPING PROTECTIVE CLOTHING

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1. INTRODUCTION

Beekeeping is one of mankind's oldest livestock farming activities. During beekeeping operations, beekeepers are attacked by worker bees protecting their colony. Various measures have been taken for centuries to protect against these attacks. One of these is the use of beekeeping protective clothing, which enable

beekeeping activities to continue despite attacks and protect the beekeeper from stings. Beekeeping suits have changed over the years according to the bee breed, region, and the needs of beekeeping activities. Essentially, these garments, designed to protect the body and head, have evolved into their current designs as a result of developing technological advancements.

The history of beekeeping is almost as old and deeply rooted as the history of humanity. The products produced by bees have always attracted the attention of humankind **[Topal, E (2021)]**. The depictions in the cave paintings in Valencia, Spain (Figure 1) are the first evidence of beekeeping activities. These depictions shed light on the fact that beekeeping is approximately 15,000 years old **[Ellis, H. (2010)]**. In the early days of human history, during the hunting and gathering era, people obtained honey by killing bees that lived in rock crevices and tree holes **[Kritsky, G. (2017)]**. Culturally, beekeeping was practiced in the Egyptian civilization, and it has been determined that the beeswax found in the tombs of pharaohs was obtained as a result of beekeeping activities **[Kritsky, G. (2015)]**. When tracing the origins of beekeeping, findings related to Egyptian civilization as well as Greek, Indian, Roman, Anatolian, and Mesopotamian civilizations have been encountered **[Akkaya, H., & Alkan, S. (2007)]**.

Figure 1. *A depiction of beekeeping on a cave wall (la Cueva de la Araña, Valencia)[1]*

The reason protective clothing for beekeeping emerged is the effect of bee stings on humans. Worker bees use their stingers to defend the colony. A honeybee stinger has a sharp structure capable of piercing even relatively tough human skin **[Ling, J. ve ark. (2016)].** This structure is barbed like a fish hook and therefore cannot be retracted **[Shing, H. (1982)].** When the bee tries to free

itself after stinging, the entire lower part along with the stinger is torn off and it dies **[Sadek, K. Ve ark (2024)]**. The consequences of a sting in a human may include immediate pain, itching, and swelling, as well as longer-lasting pain and inflammation. The person who was stung usually recovers when the stinger is removed. Most beekeepers who are stung quite frequently develop some degree of immunity. However, bee stings can even be fatal depending on the allergic reaction they cause **[Fünfhaus, A. ve ark. (2018)]**.

Looking at the history of beekeeping clothing, the development of the garments has been shaped according to the type and breed of bees, the geography, and the nature of beekeeping activities. All honey bee species except Apis mellifera originate from Southeast Asia **[Dar, S. A. ve ark. (2019)]**. Apis mellifera is native to Western Europe, the Eastern Mediterranean, and Africa. Within this species, bee races and, within the same race, ecological types (ecotypes) or populations have formed due to factors such as climate, flora, and natural enemies, depending on geography **[Ruttner, F. (2013)]**. Tropical African honey bees, a breed that evolved from many types of enemies, are more easily stimulated than European honey bees **[Halvacı, E ve ark. (2023)]**. When an African honey bee stings, it produces an alarm pheromone that very quickly alerts other bees nearby to attack. Warning behavior is less pronounced in Asian honey bees such as A. cerana and A. florea, but much more pronounced in A. dorsata. **[Kaftanoğlu (2001)]**.

Table 1. Taxonomy of the honey bee [Linnaeus C (1758)]

Kingdom	Animalia
Phylum	Arthropoda
Class	Insecta
Order	Hymenoptera
Family	Apidae
Genus	Apis
Species	Apis mellifera Apis florea Apis dorsata Apis cerana

During the Roman Empire, beekeepers covered themselves with tightly woven linen sheets to protect themselves from bee stings. **[Crane, E. (1999)]**.

Figure 2. *Beekeeper who wrapped a cloth around her head (Holkham AD 307) [2]*

In medieval Europe, honey and beeswax became important commodities for trade, and beekeeping activities developed in hives, logs, boxes, and wooden hives to meet the demand **[Galton D. (1971)]** During this period, beehives made of straw or baskets, called skep, began to be used **[Kritsky, G. (2017)]**. The simplest form of protection was provided by wrapping the head and face with a piece of cloth (Figure 2). Later, specially designed hood was encountered. In subsequent periods, clothing design ideas against face stings continued to be developed. The head covering consists of a hood attached to a cape that drapes over the shoulders; the cape can be opened or closed to the neck level, and the entire garment can be draped over the head (Figure 3).

Figure 3. *French beekeeper's hood (Reaumur, 1740) [3]*

Additionally, straw masks, once used (Figure 4), are considered the first systematic attempt by people to create a physical barrier against bee stings. In addition to face protection, the use of gloves to protect against hand stings is also seen in beekeeping activities **[Crane, E. (1999)]**.

Figure 4. *The Beekeepers, Pieter Bruegel (1568) [4]*

The movable-frame hive design, created by Langstroth in the USA in 1851, is considered a turning point in the history of Beekeeping [**Andrews, E. (2020)].** Because these hives are often processed with frames covered in bees during the active beekeeping season, increasing the risk of bee stings, hood designs incorporating hat and veil designs have been developed (Figure 5) **[Crane, E. (1999)]**.

Figure 5. *Hat and veil design (Late 19th Century) [5]*

Since 1950, the quality and comfort of protective clothing have improved in technologically advanced countries, generally as a result of higher garment

standards and the availability of new materials. Better and cheaper zippers have enabled the parts of an integrated garment to be quickly and securely attached to each other, protecting them from bees. The hood design has been repurposed as a zippered part of a professionally integrated suit **[Crane, E. (1999)]**. With the invention of Velcro in 1941, it began to be used for fastening purposes in protective clothing **[Hapsari, F. ve ark (2022)].**

At the beginning of the 21st century, beekeeping protective clothing reached their peak in terms of materials science. To address the problem of traditional beekeeping suits causing excessive sweating and discomfort during the summer months, research has focused on designing breathable (ventilated) beekeeping suits. As a result, 3D perforated fabrics have been developed that are breathable in three layers but, thanks to their thickness of 2-4 mm, prevent bee stings from reaching the skin.

2. MATERIALS AND METHODS

2.1. Examination of Existing Beekeeping Protective Clothing

Ten types of beekeeping protective clothing, including the most commonly used smock, astronaut-style, suit, and jacket, were examined in terms of design, usability, and ergonomics at beekeeping associations affiliated with cooperatives and beekeeping product sales outlets in our country.

2.2. Contentment Survey Regarding Protective Clothing Applied to Beekeepers

A survey was conducted among beekeepers in various regions of Turkey, focusing on general information and questions related to their beekeeping attire. The survey aimed to identify the problems and difficulties experienced by beekeepers in Turkey regarding the use of their current beekeeping clothing. A total of 93 beekeepers participated in the survey. The provinces where the surveyed beekeepers operate are Samsun, Zonguldak, Istanbul, Ordu, Kocaeli, Sakarya, Adana, and Muğla, with a high concentration in the Black Sea and Marmara regions. In addition, data was collected on other aspects of the beekeepers' activities (experience, number of hives, bee breeds they care for, purpose of their activity, duration of clothing use, etc.).

Table 2. Distribution of experience levels among the sample group

Beekeeping Experience	n	%
less than 1 year	1	1
1-4	12	13
5-8	19	21
9-12	22	24
13+	38	41
Number of Hives		
1-25	26	28
26-50	17	18
51-75	14	15
76-100	14	15
100+	21	23
Bee Breed		
Carniolan honey bee	33	36
Caucasian honey bee	33	36
Anatolian honey bee	17	18
Yığılca honey bee	4	4
Other	1	1
Don’t Know	4	4
Purpose of Beekeeping Activities		
Hobby	25	27
Commercial	67	73

Based on the data obtained, it was determined that the majority of beekeepers surveyed were experienced in their work and had been engaged in beekeeping activities for a sufficient period of time to be proficient in the field. The distribution of the number of hives they manage shows a close proportional distribution. The number of hives managed also affects the duration of beekeeping suit use. When the data was examined, it was determined that the most commonly cared-for bee breeds were Carniolan and Caucasian bees. None of the cared-for bee breeds were found to be aggressive African bees; in other words, the cared-for bee breeds were calmer compared to African bees. The number of hives managed also affects the duration of beekeeping suit use.

3. RESULTS

3.1. Examination of Existing Beekeeping Protective Clothing

The fabrics used in currently used and offered beekeeping protective clothing do not have a specific standard; instead, tightly woven and thick fabrics are preferred for protection against bees. The types of fabrics can include gabardine, canvas and duck fabric. Choices are largely influenced by cost. When examined in terms of pattern, clothing generally follows a single type of pattern; however, occasional pieces featuring two types of patterns are also observed. Different fabric types are also used in different parts of some beekeeping protective clothing.

3.1.1. Smock (Standard/Normal) Type

In this type of beekeeping protective clothing, the hood and the body are integrated. It usually has a round veil design. The veil in the hood is not removable. When the beekeeper feels safe, they can pull their head out through the zipper on the body and tuck the mask back onto their back. It usually has one or two pockets.

Figure 6. *Smock (standard/normal) type*

3.1.2. Jacket Type

The main design principle in this type of beekeeping protective clothing is that the hood and the body-protecting jacket are worn separately. The hood is worn by tucking it inside the jacket and can be easily removed while remaining

secure. It is easier to put on and take off compared to other beekeeping protective clothing designs.

Figure 7. *Jacket type*

3.1.3. Astronaut-style

It stands out with its innovative design in beekeeping protective clothing. This name was given to it because the design of the headgear section resembles astronaut suits. The hood is attached to the body with zippers, and these zippers, along with some clothing, can be secured with Velcro for added protection against bees. The hood can be removed securely thanks to the zipper design. As with the jacket style, the body design also features a zipper. It has more pockets than other types of beekeeping protective clothing. One of the major problems is the risk of bees stinging your face if the veil comes into contact with your skin while bending down.

Figure 8. *Astronaut-style*

3.1.4.

Beekeeping Suit

Among Beekeeping protective clothing, this is a design type that protects the entire head, body, arms and legs. Putting them on and taking them off takes more time compared to others. There are sizing issues.

Figure 9. *Beekeeping suit*

3.2. Performance Evaluations Regarding Beekeeping Protective Clothing

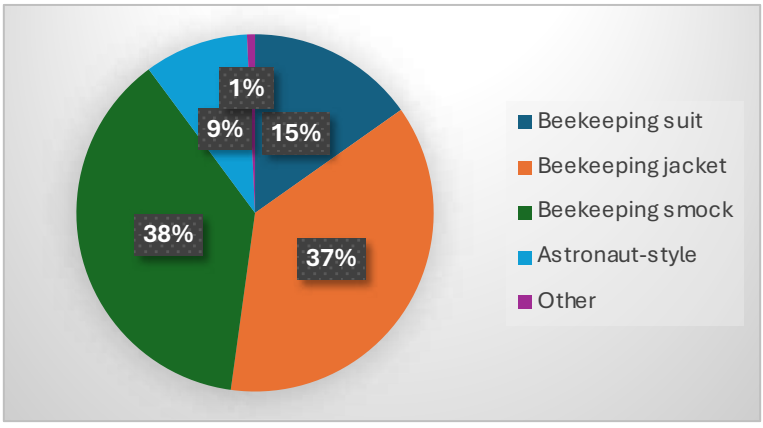

Figure 10. *Ratios of beekeeping protective clothing types used*

According to the survey data, two types of clothing used most frequently by beekeepers have emerged.: smock (normal) and jacket. These two types are

also the most commonly sold types of beekeeping protective clothing found in stores. Additionally, some beekeepers own multiple types of beekeeping protective clothing.

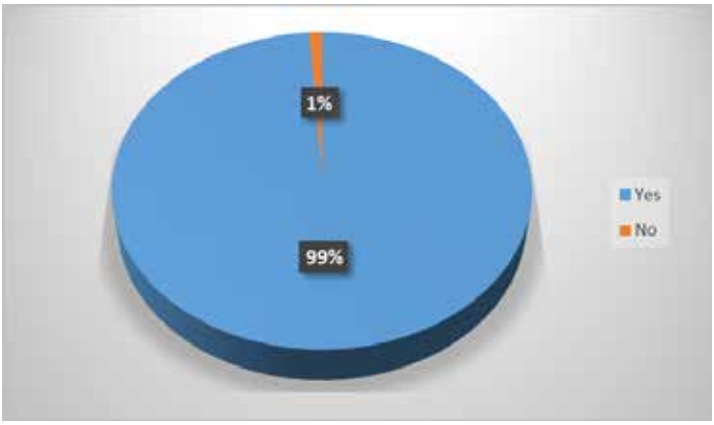

Figure 11. *The distribution of answers to the question "Do you use beekeeping protective clothing?"*

It was determined that nearly all of the beekeepers surveyed used Beekeeping protective clothing. The beekeeper who does not use protective clothing stated that he has been engaged in beekeeping for over 40 years, that he is not affected by bee venom, and that he has no difficulty performing his duties without clothing.

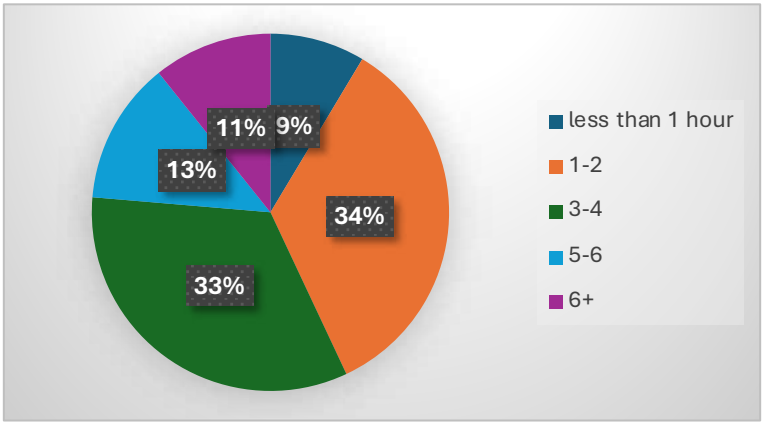

Figure 12. *Beekeeping protective clothing usage time rates*

Analysis of the data revealed that the duration of clothing use was related to the number of hives the beekeepers were tending. It has been observed that beekeepers with fewer hives also tend to use their protective clothing for a shorter period of time.

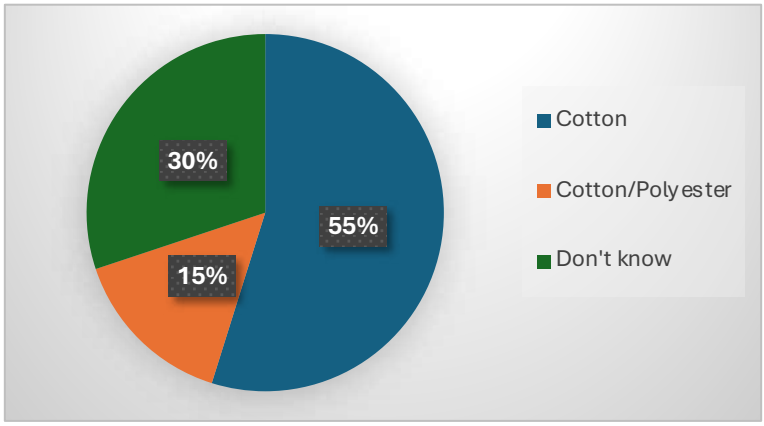

Figure 13. *The proportions of the materials used in beekeeping protective clothing.*

Analysis of the data revealed that most of the clothing used was made from cotton fibers. It has also been revealed that to a certain extent, they do not know the material of the clothing they wear. In other words, some beekeepers are not aware of the features of the equipment they use.

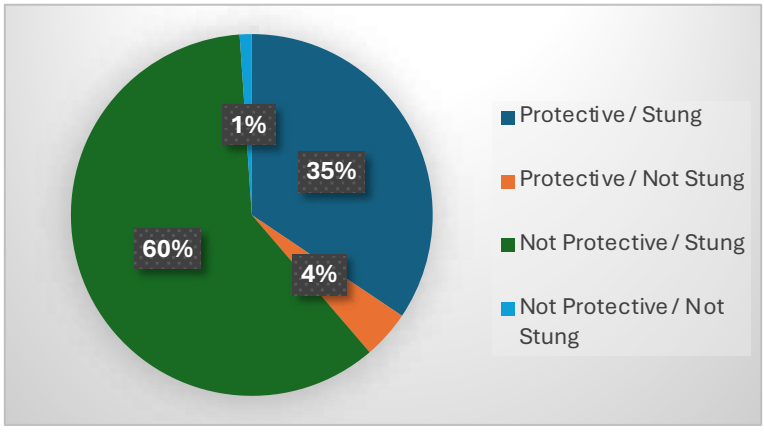

Figure 14. *Distribution of protection assessment*

According to the data obtained, 60% of beekeepers think that their clothing is not protective equipment and have been stung by bees, while 1% stated that

they did not experience bee stings despite thinking that their clothing was not protective equipment. 4% of beekeepers think their protective clothing is effective and have never been stung, while 35% have been stung but still believe it provides protection. Thus, the psychological protective effect of Beekeeping protective clothing becomes evident.

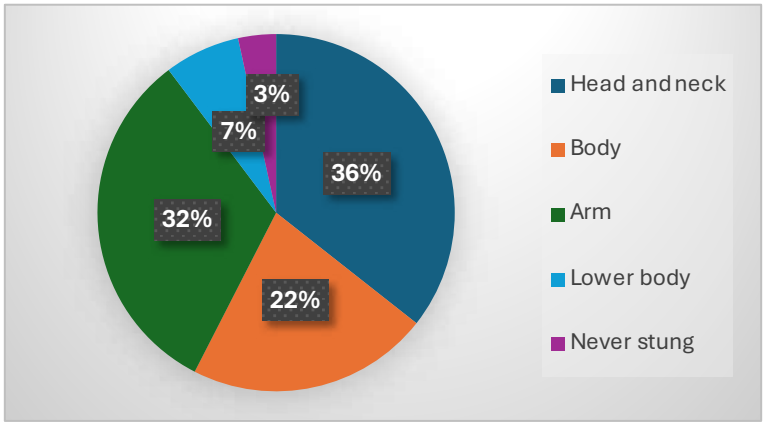

Figure 15. *Distribution of areas where bees sting humans*

When the obtained data was examined, it was determined that the areas most frequently stung by bees among beekeepers were the head/neck area, and this was found to be due to the design of the beekeeping hood and veil. It has been determined that the areas stung are those with a high concentration of capillaries, which are the target points for bees. Additionally, it was determined that the stings on the arm part were caused by the glove.

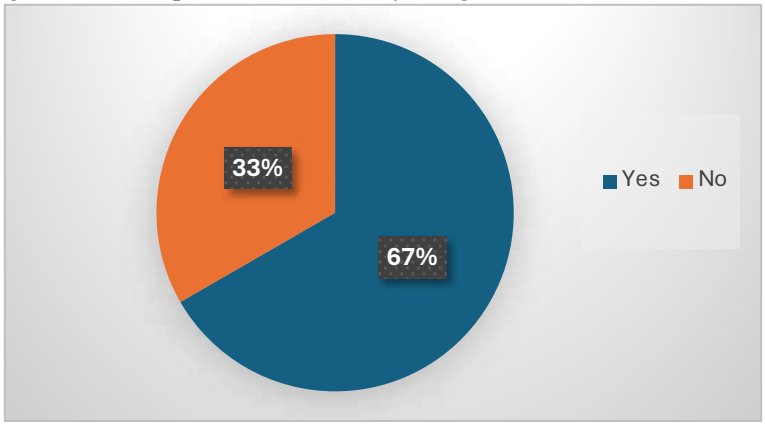

Figure 16. *The distribution of answers to the question about whether zippers/buttons/Velcro fasteners open and close easily*

According to the data obtained, it was determined that there were some minor difficulties in closing the garments. In general, 67% of beekeepers stated that zippers, buttons, and Velcro fasteners closed easily. Thus, it was concluded that studies can be conducted on the ergonomic features and preference of closure elements for clothing and wearing comfort.

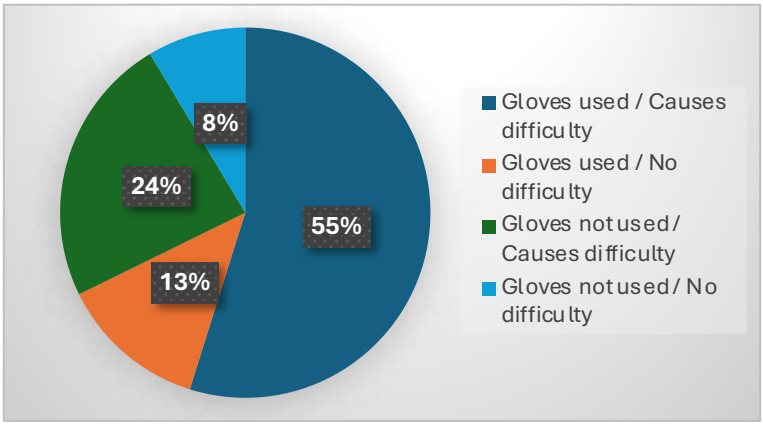

Figure 17. *Distribution of opinions regarding gloves used by beekeepers.*

According to the data obtained, glove use is observed in 68% of beekeepers. The majority of those who use gloves state that they experience difficulties while carrying out beekeeping activities. In addition, 24% of beekeepers stated that they do not use gloves because they create difficulties in beekeeping activities. Therefore, the need arises for the design of gloves suitable for beekeeping activities.

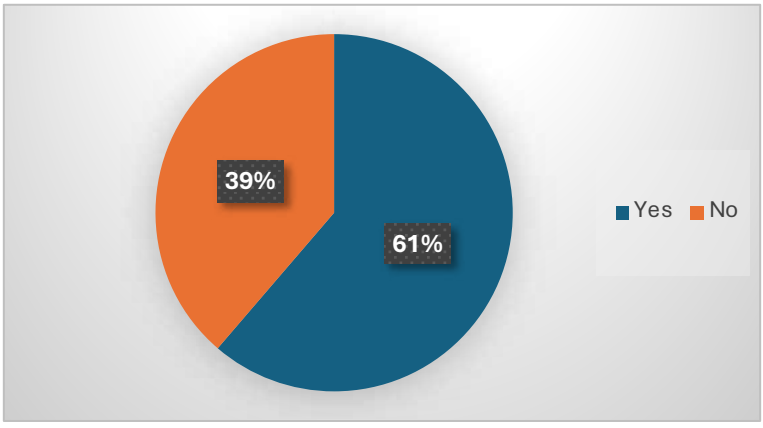

Figure 18. *The distribution of answers to the question "Is there anything obstructing the view in the veil?"*

According to the survey data, the majority of beekeepers stated that the design of the hood and veil part of the suit obstructed their vision. Therefore, design improvements should be made to the hood and veil portion of beekeeping protective clothing.

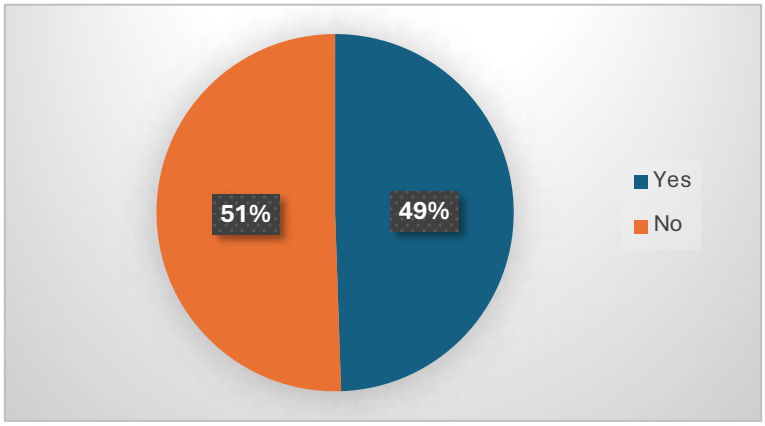

Figure 19. *The distribution of answers to the question "Does the beekeeper protective clothing have enough pockets?"*

According to survey data, 49% of beekeepers stated that their clothing had sufficient storage space. However, 51% of beekeepers thought it was insufficient and therefore wanted more pockets.

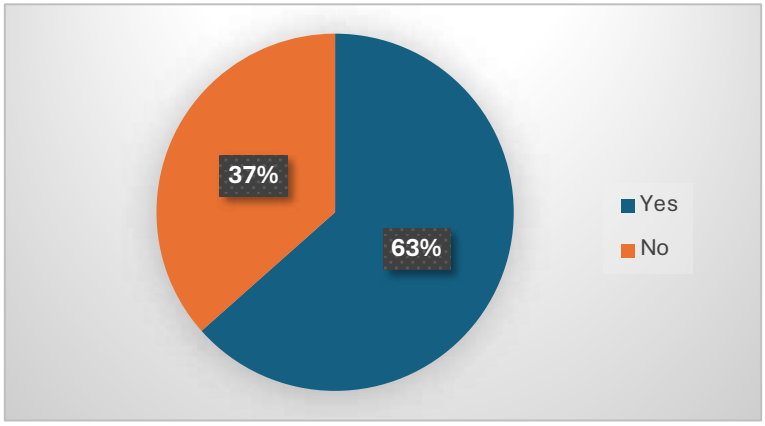

Figure 20. *The distribution of answers to the question "Do you clean your beekeeping protective clothing?"*

According to survey data, 63% of beekeepers clean their clothing by handwashing. however, many still wish these garments were machine-washable.

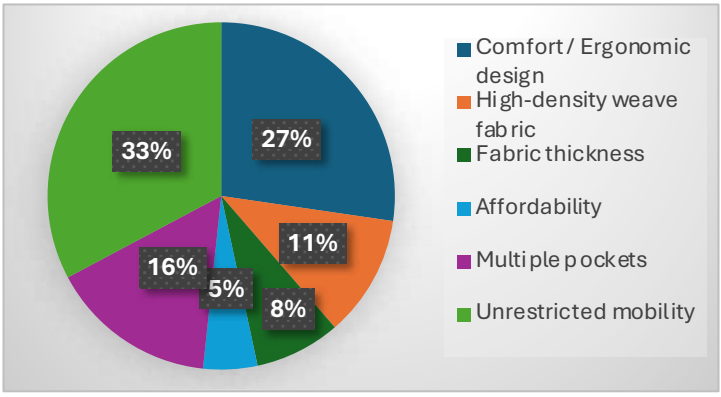

Figure 21. *Distribution of desired features for beekeeping protective clothing*

According to the data obtained from this multiple-choice question, the most prominent demands are for unrestricted mobility and improved comfort features. The desire for thicker and densely woven clothing reveals the need for a more protective beekeeping clothing than the current version.

CONCLUSION

Turkey, with its rich flora, favorable climate conditions, and ecological diversity, is a suitable country for beekeeping activities. Many bee breeds can be used in beekeeping activities thanks to this ecological diversity. Each bee breed has its own unique characteristics, and these characteristics affect the production of various bee products. In addition to honey production, bees produce bee products such as royal jelly, pollen, beeswax, and propolis, supplying the food industry as well as other sectors such as cosmetics and healthcare. The increasing beekeeping activities and honey production also bring with them increasing problems **[Tarım ve Orman Bakanlığı (2023)]**. One of these problems is the shortage of beekeeping clothing, which is also a subject of textiles.

Examination of existing beekeeping clothing revealed a lack of established standards, poor breathability of fabrics, and limited visibility in the veil area. These garments were categorized into four main types (smock, jacket, suit, astronaut-style) for analysis, and their specific problems were identified. Based

on these findings, a survey was conducted to address the needs of beekeepers in Turkey. 93 beekeepers from different provinces participated in the survey. The data obtained from this survey identified the various problems and requests of our beekeepers.

An analysis of the survey data revealed that the most frequently requested features for protective clothing include breathability and comfort, improved fit to allow unrestricted movement during beekeeping activities, and sufficient storage space for personal and operational items. When asked about the cleaning of beekeeping clothing, the majority indicated hand washing. It was concluded that instead of hand washing, a design that allows for machine washing, with the hood or just the netting removed, could be considered. The inadequate field of vision in the veil, a problem that has plagued beekeeping protective clothing for years, was also identified as an issue by the beekeepers participating in the survey. Therefore, work should be done on improving the hood design and selecting the appropriate netting to address this problem.

Gloves, another textile product used alongside beekeeping protective clothing, are worn as a precaution against hand stings during beekeeping activities, but they make the work more difficult. Therefore, they are not used by beekeepers who are accustomed to stings and have developed immunity to them. Work should be done on a more suitable glove design for beekeepers who use gloves and find them problematic during their work.

Beekeeping protective clothing offer psychological support to some beekeepers. Although they may experience stings while wearing these clothes, beekeepers believe they provide psychological protection. However, the majority of beekeepers do not consider beekeeping clothing to be protective. Beekeeping protective clothing designed with fabrics that minimize the risk of stings, and that beekeepers can trust, would be ahead compared to existing beekeeping protective clothing.

Examination of the sting sites in the suits revealed that they were mainly in the head and arm areas. Stings in the head area are generally due to the netting coming into contact with the face and neck, indicating a particular problem with current beekeeping protective clothing. This problem is especially noticeable in the suit known as the “astronaut style.” Therefore, beekeepers using this suit are advised to wear a hat under their hood.

The lifespan of beekeeping protective clothing is proportional to the number of hives the beekeeper owns and cares for. Since honey harvesting takes place in the summer, beekeepers wearing these clothes suffer from the heat, sweat

cannot escape through the clothing, and they become more tired during the process. Solutions to this problem should be sought with developing textile technology, and the comfort and ergonomics of the suits should be improved.

ACKNOWLEDGEMENTS

This research was conducted within the scope of the "Imparting Bee Repellent Properties and Improving Ergonomical Aspects to Beekeeping Suits Using Microencapsulation Method" project, supported by the Scientific and Technological Research Council of Turkey (TÜBİTAK) under the 2209/A University Students Research Projects Support Program with application number 1919B012310052. We would like to thank TÜBİTAK for their financial support.

This study was conducted at the "Textile and Manuscript Conservation and Restoration Application and Research Center," established with project number TR10/18/YMP/0137, supported by İSTKA (Istanbul Development Agency).

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CHAPTER 5

STOCK MANAGEMENT AND DIGITAL TRANSFORMATION IN PRINTING INDUSTRY

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1. INTRODUCTİON

The printing industry is one of the sectors where effective inventory management is critically important due to the diversity of raw materials, the multi-stage nature of production processes, and the increasingly variable and personalized nature of customer demands. The need to manage numerous inputs simultaneously and in a coordinated manner, such as paper, ink, printing plates, packaging materials, and various auxiliary consumables, directly affects both the cost structure and production continuity of printing businesses (Bowersox vd., 2019). Disruptions in the integration of these inputs into the supply, storage, and production processes can lead to production stoppages, delivery delays, and a decrease in customer satisfaction (Slack vd., 2020).

The increase in global competition, shortening delivery times, and rising customer expectations have led to the questioning of traditional stock management approaches in the printing industry. Today, printing businesses are shifting towards small-batch and project-based production structures rather than standard and high-volume production. This situation means that different paper types, grammage, coating, and printing characteristics are required for each

job; consequently, it makes stock planning more complex (Christopher, 2016). In this context, printing businesses are compelled to adopt demand-driven and rapidly responsive stock management approaches that are compatible with flexible production systems.

In recent years, digitalization and the widespread adoption of Industry 4.0 practices have made significant contributions to the restructuring of stock management processes in the printing industry. Thanks to enterprise resource planning (ERP) systems, warehouse management systems (WMS), barcode and RFID technologies, inventory movements can be monitored in real time and inventory accuracy can be significantly increased (Kagermann vd., 2013). These systems reduce errors resulting from manual data entry and provide managers with more reliable decision support mechanisms (Monk & Wagner, 2013).

Digital stock management systems can also be integrated with data analytics and forecasting models, enabling more accurate demand forecasts. In the printing industry, which has particularly volatile demand patterns, such digital solutions help businesses optimize their stock levels, reduce costs, and respond more rapidly to customer demands (Ivanov vd., 2021). Thus, inventory management becomes a strategic tool for businesses to gain competitive advantage.

This section discusses the strategic importance of inventory management for businesses in the printing industry; explains the inventory structure and types specific to the printing sector; and evaluates the key issues encountered in inventory management and the methods used to address these issues. Additionally, the effects of digitalization on stock management are examined, and the advantages provided by digital stock management systems to printing businesses are discussed from an academic perspective. In this context, the chapter aims to provide a comprehensive evaluation of stock management in the printing industry, both from a theoretical and sectoral perspective.

2. THE CONCEPT OF STOCK IN THE PRINTING INDUSTRY AND ITS IMPORTANCE

The concept of stock, in its general sense, refers to the raw materials, semi-finished products, and finished goods that businesses hold on hand for a certain period of time to ensure the continuity of their production and service processes. Stocks are among the key elements that balance the time mismatch between demand and supply and increase businesses' resilience against uncertainties. Especially in sectors where production processes have a multi-stage

and uninterrupted structure, effectively managing inventories is of vital importance for business performance.

The production structure of printing businesses is often order-based and project-oriented. Each customer has different printing requirements, including paper type, grammage, color profile, and delivery time (Akgül, 2012). This situation makes inventory management more complicated compared to industrial enterprises based on standard and mass production. In this structure, where standard product stocking is limited, businesses have to be able to respond quickly to customer requests and keep inventory costs under control. Therefore, in the printing industry, inventories are considered not only as physical assets but also as strategic elements that determine the flexibility, production capability, and ability to respond to customer demands of the busines (Christopher, 2016).

2.1. The Importance Of Continuity Of Production Of Inventories

In printing businesses, production processes consist of sequential and interdependent stages: pre-press preparation, printing, and post-printing operations. Any disruption in any of these stages can bring the entire production process to a standstill. In particular, delays in paper supply can lead to printing machines being unable to operate, workforces becoming idle, and delivery deadlines being missed. Therefore, stockpiles serve as a buffer mechanism that ensures production continuity (Chopra & Meindl, 2022).

The importance of stock holdings for production continuity is not limited to merely protecting against supply delays. They also provide businesses with flexibility to cope with demand fluctuations. In the printing industry, seasonal campaigns, promotional activities, and sudden customer demands can lead to rapid increases in production volume. In such cases, businesses that do not maintain sufficient stock levels struggle to meet demands and lose their competitive advantage.

For printing enterprises that are particularly dependent on international supply chains, inventories function as a protective mechanism against uncertainties in the procurement process. Global economic fluctuations, logistical delays, exchange rate volatility, and sudden changes in raw material prices further intensify the importance of inventory management in the printing industry. In this context, safety stocks have become an indispensable component of production planning and are positioned as a key element of firms' risk management strategies.

2.2. Inventory Costs and Business Performance

The effect of inventories on firm performance is evaluated through direct and indirect cost components. Inventory costs generally consist of ordering costs, holding costs, capital costs, deterioration and waste costs, as well as stockout costs (Bowersox et al., 2019). In printing enterprises, storage and capital costs are particularly prominent. The long-term storage of bulky materials such as paper and paperboard creates significant space requirements and, consequently, increases warehouse operating costs.

In cases of overstocking, in addition to increased storage space requirements, additional costs such as climate control, insurance, and security also arise. Moreover, paper and inks that remain in inventory for extended periods may experience quality deterioration due to environmental conditions; factors such as humidity, temperature, and light can lead to higher waste rates. This situation results in both increased costs and adverse effects on production quality (Heizer et al., 2020).

An insufficient inventory level leads to serious operational problems such as production stoppages, emergency order costs, and delivery delays. Emergency procurements are typically carried out at higher costs, resulting in budget overruns. In addition, delivery delays reduce customer satisfaction and undermine the firm's reliability. Such adverse outcomes may, in the long run, lead to customer losses and a contraction in market share. Therefore, for printing enterprises, determining the optimal inventory level requires establishing a delicate balance between costs and service levels.

2.3. The Impact of Inventory Management on Delivery Lead Times and Customer Satisfaction

Today, customer expectations in the printing industry are not limited solely to product quality but also encompass factors such as delivery lead time, flexibility, and service reliability. Particularly in highly competitive markets, short delivery times provide a significant competitive advantage for firms. Effective inventory management contributes to increased customer satisfaction by enabling orders to be fulfilled within planned timeframes (Christopher, 2016).

Properly planned inventory levels enable production schedules to be executed more consistently and positively affect delivery performance. Conversely, deficiencies in inventory management may lead to delivery delays, order cancellations, and a loss of customer trust. Therefore, printing enterprises must

address inventory management not merely as a production-oriented process but as an integrated component of customer relationship management.

From the perspective of sustaining customer satisfaction, inventory management is one of the factors that directly influence a firm's brand perception and market position. Printing enterprises that are able to deliver products on time and in compliance with quality standards can establish long-term business relationships with their customers and gain a competitive advantage. In this context, inventory management is regarded in the printing industry not only as an operational necessity but also as a strategic success factor.

3. TYPES OF INVENTORY IN THE PRINTING INDUSTRY

In the printing industry, the effective execution of inventory management depends on the accurate classification of inventories and the development of management policies specific to each inventory type. The multi-stage structure of production processes, the diversity of inputs used, and variations in customer demand necessitate a clear differentiation of inventory types in printing enterprises. This classification contributes both to effective cost control and to the more planned and sustainable execution of production processes (Heizer et al., 2020).

In printing enterprises, inventories are generally categorized into four main groups: raw material inventories, work-in-process inventories, finished goods inventories, and auxiliary material inventories. Each of these inventory types performs different functions at various stages of the production process and has a direct impact on firm performance.

Figure 1. *Types of Inventory in the Printing Industry*

3.1. Raw Material Inventories

In printing enterprises, raw material inventories constitute the fundamental inputs of the production process. Paper, paperboard, ink, lacquer, varnish, and coating materials are the main components of this group. Paper inventories, in particular, stand out as one of the most critical items in inventory management in terms of both cost and volume. The type, grammage, and surface characteristics of paper directly affect print quality. In this context, studies that reveal the relationship between print output quality and material properties indicate that raw material inventories should be managed not only on a quantity basis but also on a quality basis (Özomay & Özomay, 2021).

aper inventories, especially, represent the most critical inventory item in the printing industry in terms of cost and volume. The type, grammage, coating properties, and dimensions of paper may vary for each print job, which increases inventory variety. Poorly planned paper inventories may lead to both high storage costs and the gradual obsolescence of unused stocks (Bowersox et al., 2019).

While holding excessive raw material inventories ties up a significant portion of working capital, insufficient inventory levels result in problems such as production stoppages and emergency procurement costs. Therefore, printing enterprises must manage raw material inventories in a balanced manner in line with demand forecasts, production plans, and lead times.

3.2. Work-in-Process Inventories

Work-in-process inventories refer to products that have passed through certain stages of the production process but have not yet become final products. In the printing industry, items whose printing has been completed but which have not yet undergone processes such as cutting, folding, binding, cellophane coating, lamination, or varnishing are classified within this group.

While work-in-process inventories provide flexibility in the production process, holding them for extended periods may lead to quality deterioration and additional costs. In particular, storing printed products under inappropriate conditions can cause problems such as color changes, surface degradation, and physical damage. Studies examining the relationship between output quality and consumer perception indicate that color and visual preferences in printing processes also affect the performance of stored printed materials (Özomay, Keskin, & Şahin, 2021). This situation negatively affects firm performance by

increasing rework and waste rates (Slack et al., 2020).

In printing enterprises, keeping work-in-process inventories under control requires balanced planning of production flows. Mismatches between production lines may lead to excessive accumulation of work-in-process inventories. Therefore, work-in-process inventories should be managed in an integrated manner with production planning and scheduling processes.

3.3. Finished Goods Inventories

Finished goods inventories consist of printed products for which all production processes have been completed and that are ready for shipment to customers. This type of inventory plays an important role in enabling printing enterprises to respond quickly to customer demand. However, the largely make-to-order production structure of the printing industry necessitates keeping finished goods inventories at limited levels.

In printing enterprises operating on a demand-driven basis, finished goods inventories are generally held only for short periods, and products are shipped directly to customers. In contrast, finished goods inventories are more common in enterprises engaged in mass production and standardized products. For example, certain levels of finished goods inventories may be maintained for periodicals, packaging products, and promotional materials (Christopher, 2016).

Holding excessive levels of finished goods inventories increases storage costs and may lead to a loss of product value over time. Particularly for dated or campaign-oriented printed products, failure to dispatch inventories in a timely manner can result in significant losses. Therefore, finished goods inventories should be carefully planned in line with sales forecasts and customer order.

3.4. Auxiliary Material Inventories

Auxiliary material inventories consist of materials that are not a direct part of production but ensure the uninterrupted execution of production processes. Printing plates, packaging materials, spare parts, cleaning supplies, and various equipment used in maintenance and repair are included in this group.

Although this type of inventory is often overlooked, it is of great importance for production continuity. In particular, the absence of spare parts for printing machines in stock may cause a minor malfunction to turn into prolonged produ-

ction stoppages. Similarly, insufficient cleaning and maintenance materials can negatively affect machine performance and print quality (Heizer et al., 2020).

Effective management of auxiliary material inventories should be integrated with maintenance plans and machine utilization data. In this way, both unnecessary inventory accumulation is prevented and unexpected production interruptions are minimized.

4. PROBLEMS ENCOUNTERED IN INVENTORY MANAGEMENT IN THE PRINTING INDUSTRY

Inventory management in the printing industry exhibits a more complex structure compared to many other sectors due to the multi-stage nature of production processes, the diversity of inputs used, and the unpredictability of customer demand. When an effective inventory management system cannot be established, firms face both increased costs and disruptions in production. In this context, the systematic analysis of the problems that complicate inventory management in printing enterprises is of critical importance for sustainable production and competitive advantage (Slack et al., 2020).

The main inventory management problems encountered in the printing industry are concentrated around supply chain uncertainties, product and material diversity, difficulties in demand forecasting, physical storage constraints, and quality-related risks.

4.1. Fluctuations in Paper Prices and Uncertainty in Lead Times

Paper is the primary raw material of the printing industry and has a decisive impact on cost structures. Fluctuations in global raw material prices, changes in exchange rates, and increases in logistics costs cause paper prices to follow an unpredictable trend. This situation complicates inventory level planning and makes cost control more difficult for printing enterprises (Bowersox et al., 2019).

Uncertainty in lead times constitutes a significant risk factor, particularly for enterprises that rely on imported paper. Delayed deliveries may disrupt production schedules and extend customer delivery dates. In response to such uncertainties, firms often resort to holding high levels of safety stock, which in turn leads to increased storage costs and greater capital tied up in inventory.

4.2. The Impact of Paper Type and Grammage Diversity on Inventory Management

In the printing industry, the diversity of customer demands necessitates the stocking of a wide range of paper types and grammages. Coated and uncoated papers, varying surface characteristics, colors, and thicknesses significantly increase inventory variety. This situation complicates inventory management while also making the efficient use of warehouse space more difficult.

A high level of paper diversity makes inventory tracking more challenging and increases the risk of improper storage. The use of paper with an incorrect grammage or type may result in reduced print quality and the need for reprinting, leading to higher waste rates and increased costs (Heizer et al., 2020).

4.3. Project-Based Production and Difficulties in Demand Forecasting

A large proportion of printing enterprises operate under a make-to-order and project-based production model. This production structure reduces the reliability of demand forecasts and complicates inventory planning. The limited availability of standardized products makes it difficult to use historical data for future-oriented forecasting (Christopher, 2016).

Uncertainty in demand forecasting brings with it the risk of either overstocking or insufficient inventory. While overstocking renders working capital idle, insufficient inventory levels lead to production delays and customer dissatisfaction. Therefore, inventory management and production planning processes must be addressed in an integrated manner in printing enterprises.

4.4. Limitations of Storage Space and Physical Constraints

n printing enterprises, storage areas can become filled rapidly, particularly due to large-volume paper and paperboard inventories. Limited warehouse space makes it difficult to store inventories under appropriate conditions and increases the risk of product damage. Environmental factors such as humidity, temperature, and light directly affect the quality of paper and printed products.

Insufficient storage space leads to irregular stacking of inventories and difficulties in access. This situation may result in errors during inventory counts and reduce the reliability of inventory records (Slack et al., 2020).

4.5. Waste, Deterioration, and Quality-Related Risks

One of the major problems encountered in inventory management in the printing industry is waste and quality loss. Paper stored for long periods may be exposed to problems such as moisture absorption, yellowing, and deformation (Özcan et al., 2018). For inks and chemical materials, expiration dates and storage conditions are decisive factors affecting quality.

High waste rates lead directly to increased costs and also result in negative outcomes in terms of environmental sustainability (Adeel, 2022; Özomay, 2023). Therefore, regular monitoring of inventories, ensuring appropriate storage conditions, and increasing inventory turnover rates are of great importance (Bowersox et al., 2019).

5. INVENTORY MANAGEMENT METHODS USED IN THE PRINTING INDUSTRY

Inventory management in the printing industry has strategic importance in ensuring production continuity, controlling costs, and responding to customer demands in a timely manner. The presence of numerous inputs—such as paper, ink, plates, and auxiliary consumables—with different cost and usage characteristics makes it difficult to manage inventories using a single, uniform approach (Ural, 2010). Therefore, printing enterprises employ multiple inventory management methods simultaneously and prefer models that are compatible with their production structures (Heizer et al., 2020).

In this section, the inventory management methods commonly used in the printing industry are discussed under the headings of ABC Analysis, Economic Order Quantity (EOQ), Just-in-Time (JIT) production, and digital inventory tracking systems.

5.1. ABC Analysis

ABC analysis is an inventory management method based on classifying inventory items according to their level of importance to the firm. This approach is developed on the basis of the Pareto principle and assumes that a small proportion of inventory items accounts for a large share of the total inventory value (Slack et al., 2020).

In printing enterprises, ABC analysis is generally applied as follows:

- **A-Class Inventories:**

  Although they constitute approximately 10–20% of total inventory items, these are high-cost inputs representing about 70–80% of total inventory value. Paper, specialty inks, and imported printing materials fall into this category. A-class inventories require strict control, regular inventory monitoring, and detailed reporting.

- **B-Class Inventories:**

  These inventories have moderate cost levels and usage frequency, accounting for approximately 15–25% of total inventory value. Standard inks and certain auxiliary materials can be given as examples of this group.

- **C-Class Inventories:**

  This group consists of low-cost but high-usage inventory items. Cleaning materials and low-cost consumables are included in this category. Such inventories can be managed using simpler control mechanisms (Bowersox et al., 2019).

ABC analysis enables printing enterprises to focus their resources on critical inventories, reduces managerial workload, and facilitates the control of inventory costs.

5.2. Economic Order Quantity (EOQ)

The Economic Order Quantity (EOQ) is one of the most widely used classical models in inventory management. This method aims to determine the optimal order quantity that minimizes total costs by balancing ordering costs and inventory holding costs (Heizer et al., 2020).

In printing enterprises, the EOQ method is particularly preferred for:

• Standard paper types,

• Frequently used inks,

• Auxiliary consumable materials.

For the EOQ model to be applicable, demand must be predictable to a certain extent and lead times must be relatively stable. However, the prevalence of make-to-order production in the printing industry means that these assumptions cannot always be satisfied. Therefore, the EOQ method is generally used in

conjunction with other inventory management techniques.

When applied correctly, the EOQ model optimizes order frequency by:

- Preventing unnecessary inventory accumulation,
- Reducing storage costs,
- Ensuring more efficient use of working capital (Chopra & Meindl, 2022).

5.3. Just-in-Time (JIT) Production

Just-in-Time (JIT) Production is a management approach aimed at keeping inventory levels to a minimum and procuring materials required for production exactly when they are needed. The JIT philosophy is based on principles of waste reduction, process streamlining, and continuous improvement (Christopher, 2016).

In the printing industry, the JIT approach can be applied particularly in enterprises that:

- Have reliable suppliers,
- Possess strong production planning capabilities,
- Have advanced digital infrastructure.

However, uncertainties in raw material supply, logistical delays, and fluctuations in paper prices make JIT practices risky in the printing sector. Even a minor disruption in the supply chain can lead to a complete halt in production. Therefore, JIT is generally implemented in a limited and controlled manner in printing enterprises.

When successfully applied, JIT can significantly reduce inventory costs while increasing production flexibility (Slack et al., 2020).

6. THE IMPACT OF DIGITALIZATION ON INVENTORY MANAGEMENT AND DİGİTAL TRANSFORMATİON WITHIN THE SCOPE OF INDUSTRY 4.0

Industry 4.0 refers to the integration of technologies such as cyber-physical systems, the Internet of Things (IoT), big data analytics, and artificial intelligence into production processes. This approach aims to make manufacturing systems more flexible, transparent, and autonomous (Kagermann et al., 2013).

In printing enterprises, Industry 4.0 applications have transformed inventory

management from a merely supportive activity into a strategic decision-making domain. Through digital systems, inventory levels, consumption rates, and supply processes can be monitored in real time, and production plans can be updated based on instantaneous data.

6.1. The Contribution of Barcode and RFID Technologies to Inventory Management

Barcode and Radio Frequency Identification (RFID) systems are among the most widely used automatic identification technologies in inventory management. Barcode systems enable the fast and accurate recording of inventory inflows and outflows, while RFID technology provides contactless and simultaneous data reading, making inventory tracking even more efficient (Bowersox et al., 2019).

The use of these technologies in the printing industry, particularly for managing high-volume paper and packaging inventories, significantly enhances the efficiency of warehouse operations (Chopra & Meindl, 2022).

6.2. Automated Warehouse Management Systems

Automated warehouse management systems (WMS) enable the digital planning and control of all processes from inventory receipt to shipment. These systems ensure that inventories are stored in the correct locations, allow the implementation of stock policies such as FIFO or LIFO, and facilitate efficient use of warehouse space (Slack et al., 2020).

In printing enterprises, automated warehouse systems are particularly preferred by large-scale producers. The management of paper rolls and palletized products through automated handling systems reduces labor requirements and enhances workplace safety. Additionally, the digital monitoring of in-warehouse movements helps prevent inventory losses.

6.3. The Role of Production Planning and ERP Systems

Enterprise Resource Planning (ERP) systems are comprehensive software solutions that integrate inventory management with production, procurement, accounting, and sales processes. In printing enterprises, ERP systems automa-

tically update inventory levels according to production plans and enable the anticipation of order requirements (Monk & Wagner, 2013).

ERP-based inventory management provides the following advantages:

- Increased inventory turnover,
- Prevention of unnecessary inventory accumulation,
- Improvement of order and delivery processes,
- Transparent monitoring of costs.

These systems also allow management decisions to be made based on data-driven insights.

Figure 2. *ERP in the Printing Industry*

6.4. Data Analytics and Demand Forecasting Applications

One of the most significant contributions of digitalization to inventory management is the use of big data analytics and forecasting models. Printing enterprises can analyze historical production and sales data to identify demand trends and make more accurate inventory planning decisions (Kache & Seuring, 2017).

Through data analytics applications:

- Seasonal demand fluctuations can be anticipated,
- Inventory levels can be adjusted dynamically,
- Risks of waste and deterioration can be reduced.

This approach transforms inventory management from a reactive process into a proactive and predictable system.

6.5. Strategic Advantages of Digitalization for Printing Enterprises

Digital inventory management applications have become a key factor in enhancing the competitiveness of printing enterprises. Shorter delivery times, lower costs, and higher customer satisfaction are among the direct outcomes of digitalization.

Additionally, digital systems support the optimization of resource use and the reduction of waste in line with sustainability goals. In this regard, digitalization is considered a transformative process that creates both economic and environmental value in the printing industry (Heizer et al., 2020).

CONCLUSION AND EVALUATION

The printing industry is one of the sectors where the impact of inventory management on business performance is most pronounced due to its raw material-intensive structure, multi-stage production processes, and the diversity of customer demands. Within the scope of this study, inventory management in printing enterprises has been examined holistically in terms of its conceptual framework, types of inventory, encountered problems, applied management methods, and the effects of digital transformation. The findings clearly demonstrate that inventory management is not merely an operational activity but also a strategic management tool for printing enterprises.

Digitalization and Industry 4.0 applications are among the most significant factors shaping the future of inventory management in the printing industry. Through barcode and RFID systems, automated warehouse management, ERP-based production planning software, and data analytics applications, inventory accuracy has substantially increased, human errors have been reduced, and decision-making processes have become data-driven. In particular, big data analytics and demand forecasting models transform inventory management in printing enterprises from a reactive function into a predictable and proactive process (Kache & Seuring, 2017).

The overall evaluation of the study indicates that inventory management in

printing enterprises should not rely on a single method or technology. Instead, it must be designed as an integrated system that takes into account the enterprise's scale, production structure, customer profile, and supply chain characteristics. Enterprises that leverage the possibilities offered by digital transformation and integrate inventory management with production planning and customer relationship management are inevitably positioned to gain a competitive advantage.

In conclusion, effective inventory management in the printing industry has become a strategic necessity for reducing costs, ensuring production continuity, shortening delivery lead times, and increasing customer satisfaction. This study contributes to the academic literature by providing a sector-specific perspective and offers practitioners a comprehensive framework for making inventory management in printing enterprises more efficient and sustainable. Future research focusing on AI-supported forecasting models and sector-specific digital inventory management solutions is expected to provide significant contributions both academically and practically.

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