DISTINGUISHED RESEARCH FROM DIFFERENT DISCIPLINES

(HEALTH, SOCIAL, HUMANITIES AND ADMINISTRATIVE SCIENCES, EDUCATION, PHILOLOGY, SCIENCE, ENGINEERING)

Editors

Fatih ERDEMİR

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DUVAR

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FOOD PRODUCTION CHEATS ENCOUNTERED IN THE TURKISH PRESS

Şerif BALDIRAN[1]

INTRODUCTION

Today's technological advances are making the societies into the cutthroat competition and an experiencing economic race that have new changes with each passing day. The rapid increase in world population, environmental pollution due to technological development and economic imbalances between countries lead to nutritional problems, safe food supply and this makes it difficult for the safe food controls(1). The different food tricks and fraud are threatening the food safety.

Agriculture and agro-food industry in Turkey in recent years is one of a rapidly growing sector. According to estimates by the Food Federation of Associations for the food market, the food market is worth about $ 30 billion. Unfortunately, nearly 50 percent of the market is consists of under ladder manufacturing businesses. According to estimates, the state tax loss arising from under ladder production in the food sector is around 3 billion dollars. When the looking the number of the business in the sector, it looks effective. There are about 28 thousand food businesses in Turkey and has 285 thousand distribution points. Whereas the number of all food businesses in Europe are estimated to be around 25 thousand. On the other hand, 95 percent of food companies are like to SMEs in Turkey. In this case, to prevent the losses, leakage and fraud in the sector to prevent leakage and fraud are seemed hard to do.

1. FOOD SECURITY AND FRAUD

1.1. Food Safety

In recent years, the spread of industrial agriculture and food price increases had led all kinds of fraud /tricks in the food production. When this situation is bringing the food safety more important, it made the danger bigger in the food safety.

The food safety according to Turkish law numbered 5179(2) is all measures taken to disposal any physical, chemical, biological damages in the foods. The food safety is defined by FAO / WHO Codex Alimentarius Commission Experts as ordering to ensure a healthy and excellent food production food production,

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processing, storage and distribution rules and the necessary measures (tarimsurasi.tarim.gov.tr, 2009).

Then food security history is as old as mankind history and it has made a very big step. When we looked into the depth of the history, we look that mankind was confronted with food security without many occupations being in the area of food and had domestic animals for this purpose (3).

There are many national and international standards in the food safety and the quality area. Between them, ISO 9001:2000, ISO 22000, HACCP, Global-GAP (-GAP was used as a pre-Eurep), ISO 17025, GLP-Good laboratory practice (Good Laboratory Practice), BRC, IFS and traceability can be considered. The two applications are gaining weight: HACCP and traceability (4).

According to the research has made by Food Safety Association in Turkey, the percent of the 52 of the participants thinks that the food safety has declined in last decade, the percent of the 38 thinks that it has developed and 7 percent thinks that there was not any changing. As the socioeconomic level decreases, the number of people who think that food security is decreasing also decreases. At the same time, when the age increasing of the participants, the number of the thinking that the food safety decreasing is increasing. When the food safety decreasing thought at the age between 18 and 24 is %40, it is about %64 between participants that are 55-64 years old. At the same time, the participants from the citizens of the European Union level that thought the food safety increased in the last decade is about %38, staying same about %29 and the people thought going to worse are about the percent of 28 (5).

At the same research, the %82 of Turkish people is concerned about various food fraud and tricks. Respectively, then the production of unhealthy conditions (%81), fruits, pesticide residues in vegetables and cereals (%80) are concerned. European Union citizens, the most fruits, vegetables and grains in the drug residue (%63) and new viruses like bird flu (%62) are concerned.

Counterfeiting of food products

Food fraud, for the producers aiming to obtain more profit, is briefly be described as adding different foreign material that are no belonged that food or different processing from usual method and hiding it from the customers. In this business that produces this type of food, the mainstay of fake food production is minimum cost and maximum profit (6).

In Turkey, the most importing thing to threat the food safety is fake and fraudulent food products in the market. There is interesting news in the press about the food fraud. The markets low price effort to hold the customers at their hand the customer’s preferences towards to the low price because of the economic cri-

sis makes the number of the tricky and fraud food productions increase at the last 3-4 years. Fraudulent products have expelled nearly real and genuine products from the shelf. The producers that produce fraudulent products have been new ones every day because of insufficient control in the market. They also start to use the new technologies in the fraudulent productions (7).

According to the Ministry of Agriculture data in Turkey, the 10 thousand companies of 27 thousand companies cannot be controlled because of 17 thousand of them companies are registered to the ministry food seems. Last year, the food production sites, sales locations and community consumption places about 334.670 audits were controlled by provincial directorates carried out as routine inspections. As a result of the inspection, for 6049 companies or individual, administrative penalties were applied and 586 persons or the companies were has been send to the criminal court (8).

2. COMMON FOOD TRICKS ENCOUNTERED

When looking to the press, the being of the different types of food cheats can be seen. The information in this study was obtained by monitoring results of the news media organizations.

2.1. Common Encountered Food Cheats

It is given to the donor by mixing chicken skin, meat, intestine and gizzard. To make the bread white, soda is often added to the bread dough. While preparation of meat, water given about 20-25% to make it heavier. The brick powder to red pepper. The cheat in black pepper is to obtain colours by adding carcinogenic dyes. Adding chicken to red meat seems to be another food trick. Making cream cheese by melting dirty and mouldy cheeses is the most common food trick seen in cheeses. The adding the chicken gizzard skin, intestine, and even mixing of brick dust to meat to obtain the products such as sausages, salami and sausages. Ground chicken meat, red meat made from mixing. Soiled and mildewed cheese, melting cheese is melted and released it as a. Meat products such as sausages, salami and sausages to the chicken gizzard skin, intestine, and even mixing of brick dust. Taking the essence of milk and mixed with fats. Adding potash to margarines is another food trick. Using of textile dyes to make the olive dark and bright. It is understood that sodium carbonate is used to prevent the chickens from going stale before going to market.

2.3. Interpretation of the food cheats

When food frauds are investigated, it seems that they are trying to reduce the cost of food production. This type fraud seems to be commonly used in the products that are highly used and has got high price. Meat and meat products comes from their head.

In foodstuffs, some tricks seem to be done for the consumer misleading. For example the synthetic usage can be suitable with food regulation, but the problem is intended to make misleading consumer's perception. Often this deception is not a crime against the law, but they can be problem for moral issue.

Some of the special chemicals in the food trick are used to increase the shelf life of the products or have early harvest or to make them look higher quality than normal quality. For example, shoes colour added to olive and the chemicals to add to the meat can be said. Fraudulent cheese producers also can add the soy protein to obtain zero fat cheese and

There is some fraud to show the products heavier than normal. For example, the adding water to the meat or poultry products. In the "marinated meat there can be %20 water adding. As part of a marketing ploy, these products can be sold as discount name to attractive the consumer.

Another trick is to make high profits by adding a worthless product to a quality product. Especially the worthless part of the meat can be added to the quality part of it. For example the nerves in the -40 degree cold can be made as beef mince, after that it can be used as the additive. In this way, "100 percent beef" label can be put and consumer are being misled. Likewise, chicken's part such as neck, gizzard and wing tip no commercial value or by grinding their bones is called "mechanical mincing" and it can be used in some chicken sausage, salami and sausages that has got labels of "100 percent chicken".

Besides some companies who want to create a trust for their tricky production can use the TSE document or label (Turkish Standard Institutions) for their production. So, the tricky foods are hidden by a fraud document.

Another type of fraud is that a different product is seemed to be offered as another product by completely hidden. For example, horse, donkey and pig meat sold as beef or can they be used for public dining (9). Maybe there cannot be any health problem in this example but it can be problem for the public faith and culture.

Counterfeiting is not just limited with foods. It also seems to be in drinks. In the past, there was some news for Raki made under the stairway with illegal way caused deaths. Produced this type of Raki is colloquially referred to as illegal Raki. In this example, toxicity is actually a "methyl alcohol (methanol) poisoning. Food is prepared according to the statutes of the ethyl alcohol used in beve-

rages (ethanol) alcohol. Whereas the alcohol used in food according to the food regulation is the ethyl (ethanol) alcohol in beverages (ethanol). Methanol can be added to the alcohol drinks such as Raki and vodka because Methanol is much cheaper than ethyl alcohol. Whereas the Methanol can be used just in the stove fuel, cleaning, printing press and the shoes painting due to the law(10).

In fact, faced food fraud and tricks are not limited with food. There can be counterfeit drugs such as drugs such as antibiotics and vitamins. Lime powder and sweetener lactose can be used in the "Counterfeit antibiotics" productions. Counterfeit drugs can not be sold in pharmacies but they can be under the counter in grocery stores or illegal places (11).

3. FIGHTING WITH FALSE AND FRAUDULENT FOOD

3.1. Ways of Understanding unhealthy food

For the packaged food products, the best way of find out whether healthy products is to look, and pay attention to the expiration date and its content. Especially, while buying packaged meat production, label information such as "meat of the name, quantity, manufacturer and packer company name, serial number, production, its history, product protection requirements" should be considered. The Ministry of Agriculture and Rural Affairs permission can be looked for and also the expiration date should be analysed. Packaging drilled production should not be strictly bought. If the open meat is bought, the colour definitely must be checked and smiled (12).

The way to understand whether a cheese in a healthy and honest produced is to calculate the cost. It can be found out whether it is tricky or not with calculation raw material that are in the food because fake foods are often cheaper than normal food. So what can we rely on branded products? Need to think like this. Even the value of the simplest brand are millions dollars. It is not possible the owner of a mark applying this kind of way because now one wants to damage it (13).

3.2. Measures against Food Fraud

The names of the companies involved in food fraud are not revealed by the press. Some companies caught with fraud can be get rid with small fine and do same offence again. The companies involved in food fraud should be disclosed in the press. Besides, the chambers or associations of producers should be informed. The reason of the selling with low price of the some products such as ground beef, sausage and salami can be investigated. The consumers can be informed and trained against to the fractural foods.

More of food fraud is understood to take place in informal production. High

tax rates is seen a reason to work in the informal food production. In an environment that has got 10 percent inflation, a lot of food's VAT level is still 18%. The VAT must be drawn to %8 for all food and also for basic food it must be around 1%.

The food production should be best controlled and the staff's number should be increased for controlling. The authority confusion between institutions that are responsible for the food production would be eliminated

The advanced technology can be used of the food production control. For example, each shop can install the camera system for auto-control; their images can be controlled weekly, monthly. The routine audit visits cannot be very dissuasive. The camera system also will be able to help the manager to control the staff, cleaning and hygiene and the hazard risks (14).

3.3. Providing Traceability in Food Production

The biggest problem in Turkey in terms of food safety of manufactured food products is still not followed exactly. Necessary to ensure traceability in food production and related measures to be implemented, the appropriate legislation will be quickly made. To facilitate the fight against food Forgery / counterfeiting, increasing food traceability is required. The traceability defined according to the law 5179 No issued to adapt the EC 178/2002 is the monitoring of "Production, processing and marketing-related processes at every stage of foodstuffs to avoid the possibly inappropriate situation.

3.4. European Union Integration Process Acceleration

Despite, the food safety legislation is increased in Turkey with European Union harmonization laws, but there can be problem in the practice. There should be taken necessary precautions to improve the food safety with the application of the new legislation, sufficient staff employed, and the deterrent punishment and training in this area.

CONCLUSION

Fraudulent and counterfeit food in Turkey is increasing every day, people safety food consumption are endangering. The most important reason of this situation are considered a wish of the producer's lower cost to manufacture products and the consumer's more sensitivity to the food prices with economic crisis in the last years.

The food fraud is observed in the food productions such as meat and meat productions that are easily marketable and commonly consumed. Because the-

se types of products can be sold very quickly and the people against the price of food products as it can be said to be too sensitive

In the fight against fake food, food manufacturers to be registered, the monitoring of all stages of food processing and food manufacturers to control the members' professional associations and consumer awareness about the fake food is great. Besides all that the interests of the European Union harmonization laws and uncompromising implementation will help to fight against fake food.

REFERENCES

ÇOPUR Utku, YONAK Senem ve SENKOYUNCU Ayşegül, Gıda Güvenliği ve Denetim Sistemi, https://docplayer.biz.tr/, 15.11.2021

Gida Güvenliği Ve Kalitesinin Denetimi ve Kontrolüne Dair Yönetmelik, 11.06.2009, Sayı : 27255

SERPEN A. "Ab Sürecinde Türkiye'de Gıda Güvenliğinin Dünü, Bugünü Ve Yaşanmakta Olan Kargaşanın Değerlendirilmesi", *Hayvancılıkta Performans Dergisinin Ekim-2007,Sayı:108'de ve Kasım-2007,Sayı: 109*

KOÇ A. Ali, BÖLÜK, AŞÇI Serhat, Effects of Food Safety And Qualıty Standards on Concentration in Food Manufacturing Sector, Akdeniz i.i. B.F. Dergisi (16) 2008, 83-115

Rapor, Gıda Güvenliği Derneği Türkiye Gıda Güvenliği Bilgi Düzeyi Araştırması, Ağustos 2008

Uğur YILDIRIM, "Cam ERKAN", http://www.camekran.com/content.asp?c_id=3094, 06.05.2010

http://www.gidaraporu.com/gida-teknolojisi_g.htm

KATIRCI Ersin, http://www.haberdoruk.com/haberler/gundem/392-ucuz-gdalara-olan-talep-merdiven-alt-ueretimini-destekliyor-.html, 25 41

Milliyet - 18 Ekim 2006, http://www.hisargroup.org/index.php?option=com_content&task=view&id=63&Itemid=88

http://www.milliyet.com.tr/default.aspx?aType=SonDakika&ArticleID=1179578, 29 Aralık 2009

Öldüren İçki Metanol, http://www.tuba.gov.tr/yazdir.php?t=sayfa&id=456, 07.05.2010

Sahte Türkiye Raporu , http://www.atonet.org.tr/yeni/index.php?p=269&l=1, 07.05.2010

http://www.hurriyet.com.tr/yasasinhayat/14155419.asp, 22 Mart 2010

http://www.gidasanayii.com/modules.php?name=News&file=article&sid=2654, 22 Mart 2010

http://www.sivasinsesi.com/article.aspx?yazarId=23&yaziId=1867, 06.05.2010

Evaluation of the Effects of the COVID-19 Pandemic on Seafarers[1]

Bahadır TONGUÇ[2]
Murat YORULMAZ[3]

1. Introduction

The cases of pneumonia in Wuhan, China because of an unknown cause and thereafter the reporting of the situation to the World Health Organization (WHO) in December 2019, was followed by the diagnosis of the new type of coronavirus by the Chinese authorities on January 7, 2020. The coronavirus was temporarily referred to as "2019-nCov" and afterward named as "COVID- 19 virus" [1].

Corona virus can be defined as a large family of virus types that cause illness in humans and animals. Corona virus can also cause various health problems, from mild symptoms of common cold to more severe illnesses such as SARS (Severe Acute Respiratory Syndrome) and MERS (Middle East Respiratory Syndrome). The cause of COVID-19 is the "SARS Cov-2" pathogen which is a member of the coronavirus family. COVID-19 can easily be transmitted from person to person with an incubation period of 4-6 days. Its symptoms include high fever, loss of smell and taste, weakness, severe headache, cough, muscle and joint pain, and diarrhea [2].

Upon the cases that were reported in 18 other countries outside China, the COVID-19 outbreak was declared as a "Public Health Emergency of International Concern - PHEIC", the highest level of alert, by WHO director-general Dr. Tedros Adhanom Ghebreyesus on January 30, 2020. The epidemic was defined as a "pandemic" on March 11, 2021, due to the accelerated increase in cases and the emergence of over 118.000 cases in 114 countries, as well as the death of 4.291 people on a global scale [3].

Negative and life-threatening effects COVID-19 pandemic has been directly

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1 The abstract of this study was presented at the Global Maritime Conference (GMC'21) held between 18-19 November 2021 and published in the abstracts book.

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or indirectly affecting every aspect of life, including industries such as the health sector, global trade, education, and tourism. The normalization process in areas that are affected by the pandemic can take years, but it is aimed at reducing the recovery period with the ongoing scientific studies and government responses.

Demand for shipping is a derived demand and such demand is originated by seaborne commodity trade however tourism and public transportation based demand should also be evaluated because even if world trade has come to a standstill, society's travel needs would continue. During the COVID-19 pandemic, almost the opposite was experienced and while cargo/goods transportation continued, travel restrictions were imposed for people, cruise ships suspended global operations, and passenger flights were canceled [4], [5]. Since a complete transition to unmanned vehicles has not yet been achieved in the transportation industry, the human factor is still at the forefront in the management of almost all types of ships.

Among the maritime industry stakeholders negatively affected by the COVID-19 pandemic, there are many victims such as port workers, customs officers, representatives of authorized institutions and organizations, ship agents, pilots, and ship chandlers [6].

The aim of this study is to reveal the effects of the COVID-19 pandemic on seafarers, one of the most important elements of the maritime industry. For this purpose, data were obtained from 10 Turkish seafarers at the management and operation level, by the semi-structured interview technique, and analyzed with content analysis and descriptive analysis techniques using the phenomenology model as a qualitative research method.

Research findings suggest that the most significant impact of the COVID-19 Pandemic on seafarers is "the concern for family members". As a result of the research, based on the studies and research findings on the problems of seafarers working on dry cargo ships, tankers, and cruise ships working in different geographies due to the COVID-19 pandemic, solutions are offered for the maritime industry and ship managers to reduce the effects of the COVID-19 pandemic on seafarers.

2. Literature review

Seafarers have always been exposed to physical agents, chemical exposures, and biohazards which may lead to lung, skin, gastrointestinal and cardiovascular diseases [7]. Difficulties in crew changes, repatriation of the crew, and shore leaves during the COVID-19 pandemic can be listed as a part of the major causes that impose negative effects on some 400.000 seafarers stranded at sea and an-

other 400.000 stuck at home. In the ports or places where crew change is not allowed, neither the off-signers can disembark and can be repatriated, nor on-signers can travel to and join the ship [8], [9], [10], [11]. Vaccination of seafarers is also a serious issue since the ships navigate between different geographies and the commercial aim is to operate without slowing down or losing time therefore on-board vaccination programs are being developed continuously [12]. Crew change on fishing vessels have been another drama as those type of ships are calling ports less frequently and spending time at sea for longer periods [13].

COVID-19 originated risks and threats to the seafarers may be divided into two major categories. Health-related situations can be regarded as extended contracts, unreachable medication, and medical care, overworking, and extra workload. Such conditions result in fatigue, increased stress, depression, anxiety, and mental health issues. Health-related issues cause increased risks to the safety of the ship, the crew, the environment, and the cargo. Employment-related situations are lack of shore leave, repatriation, loss of employment, and renewal of certificates. These situations not only cause similar effects on seafarers but also financial damage [14], [15].

2.1. Maritime transport and seafarers under the COVID-19 pandemic

After the Chinese authorities announced on January 7, 2020, that a new type of virus, similar to SARS and MERS, temporarily called “2019-nCov” was defined, the World Health Organization officially named this disease as COVID-19 on February 11, 2020, but the definition of the virus was SARS-CoV. The COVID-19 pandemic has caused thousands of deaths worldwide since December 2019 [16].

Within the total volume of goods transported globally, approximately 80 percent of global trade is transported by sea which gives the seaborne trade the biggest share. The commercial maritime transport volume, which was recorded as 11,08 billion tons in total in 2019, was realized with 98.140 ships, which constituted approximately 2 billion deadweight tonnage. For this trade to take place, approximately 1,5 million seafarers around the world continue to work, especially under the adverse conditions created by the COVID-19 pandemic [17].

One of the important effects of the pandemic has occurred on the economic front, and it creates hard-to-recover damages in the economies of many countries [18]. The COVID-19 pandemic, the negative effects of which continue worldwide as of 2021, also leave important traces in the maritime industry. Maritime transport, being a derivative market is one of the most important veins of global

trade, and the slightest disruption in this field leads to the inability to meet basic needs such as health and food products [19]. Freight costs of commercial products have also increased considerably due to the ongoing disruptions caused by the pandemic, especially in container transportation [20].

With the "IMO Guide to Safely Ensuring Ship and Coast Personnel Interactions Regarding the Coronavirus Outbreak" published by IMO on May 6, 2020, guidelines for the conduct of protective relations between the crew and shore personnel during the pandemic process have been determined. Merchant ships can navigate for weeks without seeing the land, creating an exceptionally isolated environment for the crew. While the ship is sailing, she may be far from the risk of contagion of the pandemic, but the contact of the crew and foreigners may pose great risks, especially during port calls or sailing with pilots. Among these external elements, agency personnel, port workers and customs officers, pilots, surveyors, suppliers, sign-on crew can be counted [21]. The limited facilities that are available on board during a voyage may become insufficient against the health problems of crew, particularly under a pandemic such as COVID-19, so the reorganization of the ship and the shore contact is one of the urgent measures taken worldwide [22], [23].

Maritime Safety Committee (MSC) has approved the draft resolution during the 104th MSC session, on the issues relating to crew change, access to medical care, "key worker" designation, and seafarers' prioritization for COVID-19 vaccination. The resolution is expected to be adopted at the 32nd session of the IMO Assembly between 6 – 15 December 2021. The draft Assembly resolution urges the Member States to designate seafarers as ″key workers″ to facilitate shore leave, borderless movement with relevant documentation, easy access to medical care, vaccination of seafarers among other things [24].

2.2. Literature Review on the impacts of COVID-19 pandemic on the seafarers

The COVID-19 pandemic affected many industries, and the workforce negatively thus creating an anticipation to observe similar effects on the seafarers. Hebbar and Mukesh [25] carried out a study to reveal the effects by examining the problems that are experienced due to the pandemic in terms of receiving medical assistance, shore leave, and repatriation of the crew. The hypothesis developed in the light of the conceptual framework of the research is "The COVID-19 pandemic affects the well-being of seafarers by violating the rights of shipowners established under the MLC". In the research, a purposeful convenience sampling survey was used to examine the impact of COVID-19 on seafarers' rights in

three dimensions (coastal leave, repatriation, and medical aid). The survey was conducted online between June and August 2020 on the top 10 ship management companies, the maritime administrations of the top 5 seafarer supplying countries, and 35 shipping companies were invited to the survey, in addition to 450 seafarers. Among the invited participants, 288 seafarers, 18 maritime companies, and 6 maritime administrations participated in the research. The 18 participating companies manage 74.701 crew members on a total of 2.240 ships. According to the Maritime Labour Convention 2006 (MLC), the longest duration of service period to be less than 12 months which must be followed by the right to be repatriated. The same convention includes exceptions to service durations in force majeure conditions. International Labour Organisation (ILO). As a result of the research, it has been determined that the disembarkation of the crew at the ports is a fundamental factor that has a direct impact on the welfare of the seafarers, and it has been pointed out that the extension of a service contract without the consent of the individual is a serious violation of human rights. Thus, the hypothesis was supported.

The effects of COVID-19 restrictions on seafarers were investigated by Kaptan and Kaptan [26] where 15 officers ranking from third officers to captains participated. The study emphasizes that the need for physical manpower is expected to diminish as the technology is being progressively developed including but not limited to unmanned or autonomous ships. If the digital transition can be achieved as anticipated, a similar future phenomenon would be a more surmountable challenge.

Yorulmaz and Sevinç [27] examined the most important effects of the COVID-19 pandemic on yacht captains (2020) from the perspective of supervisor support, work-family conflict, and psychological resilience during the COVID-19 pandemic. The supervisor support and psychological resilience were observed as the most important effects of COVID-19. As the result of the study, it has been determined that the psychological resilience levels of yacht captains influence the success of the enterprise, therefore, the efforts of the managers to increase the psychological resilience levels of the yacht captains will provide a positive contribution and success to the enterprise. It has been stated that preferring individuals with high levels of psychological resilience in recruitment will also serve to reduce the work-family conflict and the turnover intention levels in the future. Yacht captains and commercial ship captains are similar in many ways, and for this reason, it would be appropriate for the human resources departments of commercial ship management companies to choose candidates with high psychological endurance to minimize the mood disorders of the officers caused by the COVID-19

pandemic and to achieve an efficient performance.

A survey consisting of 35 questions under 4 scales was conducted with 169 Turkish citizens of different qualifications who participated in Bolat's [28] study on the effects of the COVID-19 pandemic in terms of seafarers in the Turkish maritime industry. Dimensions in the survey are personal, ship facilities, ship experience, and finally seafarer and COVID-19. Within the findings, it is stated that some of the seafarers continue to work or must work on the ship even though their contract period has expired. In this study, it was also mentioned that air transport became impossible from time to time due to the COVID-19 pandemic, the closure of the countries' borders, and some other factors. It is advised that these negativities not only affect the health and safety of the individual but also affect the psychology of their families. In the discussion and conclusion of the study, it has been determined that the seafarers on board the ship feel safe as the sign-on crew takes necessary tests before joining the crew because the ships have relatively closed-circuit living spaces. COVID-19 pandemic's psychological damage to people was also restated.

Couroubis, Menelaou, and Adami's [29] research examined the impact of the COVID-19 pandemic on the lives and well-being of seafarers. The hypothesis of the research tests the claim that the effects of the pandemic on seafarers working or waiting to be employed on commercial ships are significant but underestimated by authorities, employers, and the community. The scope of the research is limited to seafarers of different ethnicities that are employed on commercial tankers and dry cargo ships. A structured questionnaire was used as the data collection method in the study and among the 17 questions that were answered by a total of 400 participants serving on 76 ships for 5 weeks included; where and when the crew members signed on the ships, the duration of the contracts, leave periods, their predictions about repatriation, their reactions to the fact that they have to continue the shipboard service exceeding the maximum allowed period, the relationships of the crew members with their families, and the absence of shore leave during port stays. Additionally, the following questions were addressed to 100 participants who are waiting to join ships; the unemployed period between two employments, whether the pandemic has delayed joining the crew, family pressures due to the delays in employment, seeking alternative employments due to financial reasons. As a result of this study, it is believed that the seafarers have concerns about both the current situation and their future careers. It is emphasized that although working at sea implies an isolated environment, spending a long time on board a ship triggers emotional fatigue and stress, and as a result, work performance is negatively affected. The serious effects of the COVID-19

pandemic on seafarers include concerns such as the difficulties on repatriation of seafarers and facilitating crew changes, health problems that may occur on board, the welfare of their families, the effects of confinement and isolation, the sign on crew, physical and emotional fatigue, and financial difficulties. While there are similar impacts on potential on-signers, there is a greater financial concern. The suggestions of the study can be listed as the comprehensive identification of seafarers' concerns, structuring the problems to eliminate unsolvable ones and resolve the rest, taking initiatives to protect the mental health of seafarers, developing plans for better management of future pandemics, conducting studies on the priorities of the sector by national and, WHO being in the first place, by supranational organizations.

In the study of Pesel, Canals, Sandrin and Jensen [30], examining the effects of the COVID-19 pandemic on the welfare levels of seafarers working in the East Adriatic Sea, a Likert type rating system was used. In the discussion phase of the study, it was determined that half of the sample did not feel safe while doing their job due to the pandemic. 60 percent of the sample thinks that everything that needs to be done in terms of worker health is not sufficiently done. The claim that stress from overtime work drives seafarers into an anxious state has been confirmed. On the other hand, it was mentioned that the participant group, which seemed relatively uneventful, was not free from all concerns, but that their personal resistance was higher. It is also noted that among the factors that can create the additional resistance mentioned here, the effect of the sea experience of the seafarer is high.

A qualitative study used a sample of 752 seafarers, covering those at sea and ashore. The questionnaire aimed to collect data on the mental, physical, social, and economic well-being of seafarers. The result shows that the main factors affecting the well-being of seafarers are work durations, periods of rest, isolation, feelings of being abandoned by the community, and unemployed periods. The study examines the effects and reflections under different categories such as social, mental, physical, and financial well-being [31]. The findings can be used while developing effective strategies and policies to support the well-being of seafarers.

Doumbia-Henry [32] describes seafarers as frontline workers. The conceptual framework of the study is the problems affecting global shipping during the pandemic period that consist of topics such as global governance and response to the effects of COVID-19 on shipping, and the response of the industry and governments. It contributes to the literature, especially since it has gathered the approaches, studies, and interventions of United Nations Organizations such as the Wor-

ld Health Organization (WHO), the International Maritime Organization (IMO), the International Labor Organization (ILO), and the International Civil Aviation Organization (ICAO) under a single title. Pesel et al. (2020) collected data from 72 seafarers in a survey named 'General Health Form' in the study evaluating the welfare of seafarers and the measures taken by shipping companies during the COVID-19 pandemic period. Three additional questions are about how precautions are taken on board regarding COVID-19. The claim that seafarers experience excessive work stress in the unusual situation caused by the pandemic has been confirmed by this study. Co-implementation of human-centred and organization-oriented measures have been advocated as the most promising approach for alleviating the work stress of seafarers.

3. Methodology

Phenomenology design, one of the qualitative research methods, was used in the research. In the phenomenology design, which is used to reveal the experiences, thoughts and opinions of individuals or groups about a certain event or phenomenon [33], [34].

The convenience sampling method as a non-probability sampling method was used in the study. The population of the research consists of 10 Turkish seafarers who are employed on board different types of ships that are being managed under 5 different ship management companies domiciled in Turkey.

Table 1. Questions.

Are you concerned about being infected with COVID-19 in your working environment on board?
Are you concerned about the possibility of contact with a COVID-19 infected seafarer / port worker / ship agency personnel? If yes, please state which.
Are you concerned about the restrictions in your life when infected with COVID-19?
Is your work performance affected by the concern of being infected with COVID-19? If yes, how?
Is your work motivation affected by the concern of your family members being infected with COVID-19? If yes, how?

A structured questionnaire, comprised of a total of 5 open-ended and closed-ended questions, was administered to 10 serving Turkish seafarers who participated in the study voluntarily. The data of the research consists of the answers to the questions shown in Table 1.

Table 2. shows the demographic data of the participants of the study. All the participants are male seafarers (100%) and 8 of them are married (80%). 3 of the respondents were Captains (30%), 4 of them were Chief Mates (40%) and 3 of

them were Second Mates (30%).

Table 2. ***Demographic data of the participants.***

Participants (n=10)	Ranking	Experience	Ship	Status
O1	Captain	17	Tanker	Married
O2	Chief Mate	11	Bulker	Married
O3	Second Mate	04	Coaster	Married
O4	Chief Mate	10	Container	Single
O5	Chief Mate	12	Bulker	Married
O6	Second Mate	04	MPV	Married
O7	Captain	23	Bulker	Married
O8	Chief Mate	09	Container	Married
O9	Second Mate	05	MPV	Single
O10	Captain	27	Bulker	Married

The professional experience of the participants varies between 4 and 27 years. The type of ships that the participants are employed on are tankers (10%), bulkers (40%), coasters (10%), container ships (20%), and Multi-Purpose Ships (20%).

4. Findings

As seen in Table 3, all the participants are concerned about the various effects of COVID-19, including infection to self and others, contact with infected individuals, possible restrictions to life when infected, negative effects to work performance, and the concern about their family members' wellbeing.

Table 3. ***YES/NO Questions.***

#	Question	Positive	Negative
1	Are you concerned about being infected with COVID-19 in your working environment on board?	100%	0%
2	Are you concerned about the possibility of contact with a COVID-19 infected seafarer / port worker / ship agency personnel?	100%	0%
3	Are you concerned about the restrictions in your life when infected with COVID-19?	100%	0%
4	Is your work performance affected by the concern of being infected with COVID-19?	100%	0%
5	Is your work motivation affected by the concern of your family members being infected with COVID-19?	100%	0%

Table 3.1 contains the answers of the respondents and in accordance, Table 3.2

summarizes respondents' choices over the types of threats.

Table 3.1. ***Are you concerned about the possibility of contact with a COVID-19 infected "seafarer" and/or "port worker" and/or "ship agency personnel"?***

Participants (n=10)	Answers
O1	I am more concerned about contact with an infected sign-on crew and agency personnel because stevedores are usually not allowed in the accommodation deck nor closed spaces of the ship.
O2	I am concerned about contact with any of them. Some ports still allow agency personnel on board the ship during port calls and their personal protective equipment seems insufficient.
O3	I am concerned about all of them and the pilots visiting the bridge. Ship's inward/outward formalities can be conducted remotely, but stevedores and pilots must physically attend on board.
O4	I am concerned with all. Sign-on crew should be properly tested, perhaps before a day before boarding the ship, not a few hours before joining us. Ships are isolated places while at sea, with limited medical facilities.
O5	With seafarers, as more time spent on board with them, compared to port workers or agency personnel
O6	I am concerned about all of them. Ports must not allow properly equipped individuals in the port or on board the ships.
O7	Yes, I am concerned with all of them, but mostly with seafarers
O8	In this order: Seafarers, agency personnel, port workers
O9	I am concerned with all of them
O10	Ship agents are obliged to wear PPE, but crew members are not usually using those while at sea. I am mostly concerned with crew members, i.e., seafarers

Table 3.2. ***Type of threat.***

Type of threat	O1	O2	O3	O4	O5	O6	O7	O8	O9	O10
Seafarer	·	·	·	·	·	·	·	·	·	·
Port worker		·	·	·		·	·	·	·	
Agency personnel	·	·	·	·		·	·	·	·	

Regarding the answers, Chart 1 shows the significance of the threat where the concern of contact with seafarers bears the majority share of 40%, followed by the concern of contact with agency personnel in second place by 32% and lastly the concern of contact with port workers is 28%.

Chart 1. Percentage of threat.

In the light of the responses, it is apparent that respondents consider port workers as less likely to be in close contact with the crew, particularly in closed spaces.

Table 4. How is your work performance affected by the concern of being infected with COVID-19?

Participants (n=10)	**Answers**
O1	Negatively. As the captain of the ship, I am responsible for my crew, and during the pandemic, it lays a tremendous burden on my shoulders.
O2	There are limited periods on board that you can socialize and take a rest. This is not very possible nowadays, so the mind is not having sufficient rest.
O3	I am concerned about getting infected and cannot throw this thought out of my mind even during my watch.
O4	I work on board a container ship that has very fast and delicate operations. Sometimes I worry about being infected on board, especially during the voyage.
O5	I am trying to stay as isolated as possible, and this causes social inadequacy, which is reflected in my work. I refrain from close contact with other crew members.
O6	Sometimes it disturbs my concentration
O7	Thinking about being stranded at sea makes me anxious
O8	I am the chief mate, and I am also responsible for cargo operations. If I get infected, I won't be able to fulfill my duties.
O9	I had to stay and work beyond my contract period due to an infected crew member. This has negatively affected my performance on board.
O10	I fear losing my life at sea when I am away from my family.

Participants' responses to the effects of COVID-19 on the work performance are described in Table 4 which shows that the work performance is affected negatively by the fear of getting infected or concerned about their family members.

Table 5. How is your work motivation affected by the concern of your family members being infected with COVID-19?

Participants (n=10)	Answers
O1	Every time I think about this possibility or a similar one, I even think about quitting sea life and settle ashore. I can feel an early retirement coming as I have sufficient funds and assets to sustain my living.
O2	I am demotivated because I cannot stand losing my beloved ones while I am away.
O3	I can hardly maintain my motivation, thanks to trading in close geography to my hometown but things can change and family comes first.
O4	I lost a close friend while I was at sea which makes me think once more about quitting my job and finding another one ashore.
O5	I am concerned about my family, and they are concerned about me. Working at sea, away from your family, helping cargoes to travel the world, is a noble profession, but we have come across a unique reason to think twice in the next contract.
O6	It is indeed worrisome. I can get easily distracted when I think about my family.
O7	I am planning to work in short-sea service but not in deep-sea trades anymore. I want to be closer to my family.
O8	I am planning to have a break soon, to spend time with my family.
O9	I feel the necessity to communicate with my family when I am at sea, much more than ever. I am not so motivated to do this job for ages.
O10	It makes me lose my motivation when I am at sea.

In parallel to the data given in Table 4, the responses in Table 5 are showing the increased tendency to quit working at sea and either get retired or move to shore-based maritime jobs. The existing disadvantages of seafaring life are scaled up in conjunction with the COVID-19 related issues, the participants are worried and concerned about their families ashore. Such increased demotivation may lead to a steep decay in demand for sea careers and a shortage in officers in the forthcoming years seems inevitable. This trend would also influence the demand for maritime training negatively.

5. Discussion and Conclusion

The maritime industry is of great importance to the global economy. In this research, the difficulties for the first time in history, due to a global cause other than war, were experienced by the seafarers who are the most important elements of the industry. Departing from the existing studies in the literature, prospective

measures that are taken, and planned to be taken, are also examined apart from the current situation regarding the seafarers, working in all types of ships while serving maritime transportation.

As the research finding; it is believed that a fundamental response is going to be achieved for future cases by adding more functionality and standardization to the existing measures. Additional costs will inevitably arise in the act of taking additional precautions, and it will have reflections on both the freight markets and the cruise industry until life returns to normal, but there can be no maritime industry yet without the seafarers. There is still a long way to go for unmanned merchant ships because not only the technology but also the regulations and international law relating to safety and security, amongst many others, have to be developed and put into use. The existing demand for seafarers shows a shortage of officers and a surplus of ratings therefore the profession requires a regainment of reputation and confidence by an effective focus and attention to seafarers' major problems. The determination and implementation of more effective strategies by national and international organizations will prevent thousands of seafarers from being stranded or unable to work in the event of a similar crisis. In addition, timely and satisfactory responses will help remotivate the seafarers and the successors of the maritime profession.

References

Article

[4] van Tatenhove, J. P. (2021). COVID-19 and European maritime futures: different pathways to deal with the pandemic. *Maritime Studies*, 63-74.

[5] Dulebenets, M. A. (2020). COVID-19 effects on maritime transport. *Journal of the Institute of Seatransport*, 3-5.

[6] Okeleke, U. J., and Aponjolosun, M. O. (2020). A study on the effects of COVID–19 pandemic on Nigerian seafarers. *Journal of Sustainable Development of Transport and Logistics*, 135-142.

[7] Carter, T., and Jepsen, J. R. (2014). Exposures and health effects at sea: report on the NIVA course: Maritime Occupational Medicine, Exposures and Health Effects at Sea. *International maritime health*, 114-121.

[8] De Beukelaer, C. (2021, October). COVID-19 border closures cause humanitarian crew change crisis at sea. *Marine Policy, 132*, 104661-104661.

[11] Stannard, S. (2020). COVID-19 in the maritime setting: the challenges, regulations and the international response. *International Maritime Health*, 85-90.

[12] Battineni, G., Kumar, S., Mittal, M., and Amenta, F. (2021, March). COVID-19 vaccine on board ships: current and future implications of seafarers. *International Maritime Health, 72*(1), 76-77.

[13] Vandergeest, P., Marschke, M., and MacDonnell, M. (2021). Seafarers in fishing: A year into the COVID-19 pandemic. *Marine Policy*.

[15] Paschalia, D., Maria, C.-A., and Inga, B. (2021). Mental health and occupational safety of seafarers. *International Scientific Conference on Medicine*, *57*, p. 148. Riga.

[16] Kurt, A. F., and Karaali, R. (2020). SARS-CoV-2 nedir, bu güne nasıl geldik? *Medical Research Reports*, 54-62.

[18] Yazır, D., Şahin, B., Yip, T. L., and Tseng, P.-H. (2020). Effects of COVID-19 on maritime industry: a review. *International Maritime Health*, 253-264.

[20] Ece, N. J. (2020). COVID-19 salgınının konteyner taşımacılığı ve limanlarına etkisi. *Mersin Üniversitesi Denizcilik ve Lojistik Araştırmaları Dergisi*, 47-66.

[22] Schlaich, C., Lucas, K., Sydow, S., Beyer, E., and Faesecke, K. (2021). Procedural aspects of COVID-19 vaccinations for seafarers on

ocean-going vessels. *International maritime health, 72*(3), 179-182.

[23] Fanoy, E., Ummels, A., Schokkenbroek, V., van Dijk, B., Wiegmans, S., Veenstra, T., van der Ejck, A. A,. Sikkema, R. S., de Raad, A. (2021). Outbreak of COVID-19 on an industrial ship. *International maritime health, 72*(2), 87-92.

[25] Hebbar, A. A., and Mukesh, N. (2020). COVID-19 and seafarers' rights to shore leave, repatriation and medical assistance: a pilot study. *International Maritime Health*, 217-228.

[26] Kaptan, M., and Kaptan, B. O. (2021). The investigation of the effects of COVID-19 restrictions on seafarers. *Australian Journal of Maritime & Ocean Affairs*, 1-13.

[27] Yorulmaz, M., and Sevinç, F. (2020). Supervisor support and turnover intentions of yacht captains: the role of work–family conflict and psychological resilience during the COVID-19 pandemic. *International Journal of Contemporary Hospitality Management, 33*(5), 1554-1570.

[28] Bolat, F. (2021). COVID-19 pandemisinin Türk denizcilik sektöründe gemi insanları yönünden etkilerinin araştırılması. *Çukurova 6th International Scientific Researches Conference*, (pp. 235-246). Adana.

[29] Coutroubis, A. D., Menelaou, A. A., and Adami, E.-H. (2020). Impact of coronavirus disease (COVID-19) on seafarers' life and well-being. *International Journal of TROPICAL DISEASE & Health*, 16-27.

[30] Pesel, G., Canals, M. L., Sandrin, M., and Jensen, O. (2020). Well-being of a selection of seafarers in Eastern Adriatic Sea during the COVID-19 pandemic 2020. *International Maritime Health*, 184-190.

[31] Sliskovic, A. (2020). Seafarers' well-being in the context of the COVID-19 pandemic: A qualitative study. *WORK: A Journal of Prevention, Assessment & Rehabilitation, 67*(4), 799-809.

[32] Doumbia-Henry, C. (2020). Shipping and COVID-19: protecting seafarers as frontline workers. *WMU Journal of Maritime Affairs*, 279-293.

[33] Özdemir, M. (2010). Nitel veri analizi: Sosyal bilimlerde yöntembilim sorunsalı üzerine bir çalışma. *Eskişehir Osmangazi Üniversitesi Sosyal Bilimler Dergisi, 11*(1), 323-343.

Report

[1] World Health Organisation. (2020). *Novel coronavirus (2019-nCoV).* World Health Organisation situation report - 1.

[2] Directorate General of Public Health. (2020). *COVID-19 (Sars-CoV-2 infection) guide.* Ankara: Republic of Turkey, Ministry of Health.

[10] International Chamber of Shipping. (2020). *Crew change report COVID-19(20)88.* London: International Chamber of Shipping.

[14] Joint initiative of the UN Global Compact (UNGC), the Office of the High Commissioner for Human Rights (UN Human Rights), the International Labour Organization (ILO) and the International Maritime Organization (IMO). (2021). *Maritime human rights risks and the COVID-19 crew change crisis.*

[17] United Nations Conference on Trade and Development [UNCTAD]. (2021). *Review of maritime transport 2020.* Retrieved from UNCTAD: <https://unctad.org/webflyer/review-maritime-transport-2020>

[21] Thomas Miller. (2021, August). *Global crew change advice*. Retrieved from:<https://www.ukpandi.com/news-and resources/articles/2021/crew-changes---a-comprehensive-guide/>

[24] International Maritime Organization. (2020, December 14). Coronavirus (COVID-19) – Designation of seafarers as key workers. *Circular Letter No.4204/Add.35*. London, United Kingdom: International Maritime Organization.

Book

[19] Stopford, M. (2008). *Maritime economics.* Routledge.

[34] Christensen, L. B., Turner, L. A., & Johnson, R. (2020). *Araştırma yöntemleri desen ve analiz* (Vol. 3). (A. (. Alpay, Ed.) Anı yayıncılık.

Internet

[3] World Health Organisation. (2020). *WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020*, vieved 12 June2021,<https://www.who.int/directorgeneral/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-COVID-19---11-march-2020>

[9] International Maritime Organization. (2020). *400,000 seafarers stuck at sea as crew change crisis deepens*, vieved 08 June 2021, <https://www.imo.org/en/MediaCentre/PressBriefings/Pages/32-crew-change-UNGA.aspx>

REFERENCES

ÇOPUR Utku, YONAK Senem ve SENKOYUNCU Ayşegül, Gıda Güvenliği ve Denetim Sistemi, https://docplayer.biz.tr/, 15.11.2021

Gida Güvenliği Ve Kalitesinin Denetimi ve Kontrolüne Dair Yönetmelik, 11.06.2009, Sayı : 27255

SERPEN A. "Ab Sürecinde Türkiye'de Gıda Güvenliğinin Dünü, Bugünü Ve Yaşanmakta Olan Kargaşanın Değerlendirilmesi", *Hayvancılıkta Performans Dergisinin Ekim-2007,Sayı:108'de ve Kasım-2007,Sayı: 109*

KOÇ A. Ali, BÖLÜK, AŞÇI Serhat, Effects of Food Safety And Qualıty Standards on Concentration in Food Manufacturing Sector, Akdeniz i.i. B.F. Dergisi (16) 2008, 83-115

Rapor, Gıda Güvenliği Derneği Türkiye Gıda Güvenliği Bilgi Düzeyi Araştırması, Ağustos 2008

Uğur YILDIRIM, "Cam ERKAN", http://www.camekran.com/content.asp?c_id=3094, 06.05.2010

http://www.gidaraporu.com/gida-teknolojisi_g.htm

KATIRCI Ersin, http://www.haberdoruk.com/haberler/gundem/392-ucuz-gdalara-olan-talep-merdiven-alt-ueretimini-destekliyor-.html, 25 41

Milliyet - 18 Ekim 2006, http://www.hisargroup.org/index.php?option=com_content&task=view&id=63&Itemid=88

http://www.milliyet.com.tr/default.aspx?aType=SonDakika&ArticleID=1179578, 29 Aralık 2009

Öldüren İçki Metanol, http://www.tuba.gov.tr/yazdir.php?t=sayfa&id=456, 07.05.2010

Sahte Türkiye Raporu , http://www.atonet.org.tr/yeni/index.php?p=269&l=1, 07.05.2010

http://www.hurriyet.com.tr/yasasinhayat/14155419.asp, 22 Mart 2010

http://www.gidasanayii.com/modules.php?name=News&file=article&sid=2654, 22 Mart 2010

http://www.sivasinsesi.com/article.aspx?yazarId=23&yaziId=1867, 06.05.2010

NUTRITIONAL PROBLEMS in CHILDREN and SOLUTIONS

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INTRODUCTION

Nutrition, healthy growth and development, to sustain life and to prevent diseases is to eat a balanced and adequate amount. Adequate and balanced nutrition is important in terms of growth and development, maintenance of life, prevention of diseases, protection and improvement of health and improvement of quality of life (1).

The child should have sufficient and healthy eating habits in order to develop his / her skills in all development areas (2). Nutrition affects physical health. It is known that physical health also affects mental health. In other words, it is necessary to pay attention to nutritional patterns and habits for mental development, which has an important place in developmental areas, even indirectly (3). Nutrition contributes positively to bio-psycho and physical development both in terms of children and families (4).

Adequate and balanced nutrition growth, development, assets activities in the best way. nutrients necessary for people who are defined as taking to protect and improve. The right amounts of nutrients, at the right times and consciously consume (4). Nutrition, which is one of the most important human needs; growth of life nutritional use of nutrients in the body to maintain and maintain health (5).

Nutrition; in every process that starts in the womb and goes to the end of life. It is an action that needs to be done consciously (5) and prevention of diseases, especially in preschool wrong eating habitsproblems can occur (6).In childhood; teeth, bone, muscle development, growth and blood production. Nutritional characteristics of children in healthy body functions and the requirement for nutrients is different. Children age, gender and physical adequate and balanced nutrition appropriate to the activity (7)

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Adequate and balanced nutrition;

- Sustaining life,
- Growth and development,
- Productivity,
- For health and well-being
- Starting in the womb, infancy, childhood, adolescence and adulthood

Energy and Nutrient Requirements

- Energy
- Carbohydrate
- Protein
- Oil
- Marc
- Vitamins and minerals (9).

NUTRITION PROBLEMS

Inadequate and unbalanced nutrition; On the one hand, individuals' physical, social and mental development, economic and social development of society on the other hand adversely affect. Most of these negatives are infants and children it is affected (10). WHO is the primary cause of 7% of child deaths and secondary cause of 46% insufficient and unbalanced nutrition (11).

Researches; the rate of child mortality in undernourished growth of children in malnourished societies. rates are slower than adequate fed societies. Again malnutrition also affects children's mind development negatively. It is known. Inadequate and unbalanced nutrition beriberi, scurvy, pellegra, marasmus, xeropthalmia, anemia,rickets, such as the formation of some diseases directly, cardiovascular diseases, infectious diseases such as diabetes, hypertension, obesity and indirect development of diseases. Also; chronic diarrhea, child diseases such as measles, whooping cough, diphtheria, and respiratory diseases malnutrition is frequently seen as a result of insufficient and unbalanced nutrition and some results in death (12).

Factors affecting nutrition in children: family environment, social tendencies, communication with peers, presence of disease (13). Data on the nutritional status of children in the world have been reviewed and high levels of mineral deficiencies observed, especially the zinc deficiency negatively affects growth attract (14).

Inadequate or unbalanced nutrition, the body's macro and micro nutrient balance deterioration, malnutrition or the emergence of obesity, rickets, tooth decay and causes the development of anemia. Malnutrition of under-five deaths worl-

dwide 35% directly or indirectly; disability is %11 for responsible (15).

In Turkey, 0-5 years ıt was found that 4.1% of the children were very weak / underweight and 13% were weak. Turkey Demographic and Health Survey 2013 According to the data of our country under the age of five every 10 one of the children was stunted, 1/3 of these children were found to be serious stunted. Increased stunting after the first 6 months, especially in 24-59 months, 12% important indicator of imbalance in children's nutrition (16). Turkey Nutrition and Health Survey data for 2010 under five-examined micro nutrient intake of children is not enough. With campaigns The rate of iron deficiency anemia seen in children aged 12-23 months from 30% to 7.8% reduced. Although the incidence has decreased, this ratio is still quite high (18).

In recent years, the problem of obesity in children has started to be emphasized. This situation caused by unbalanced nutrition is even more important if precautions are not taken. 14.6% of children aged 0-5 years in Turkey underweight / overweight, while 5.9% overweight / obese. These rates are higher in children of high socioeconomic families high (19).

As a result, in order to reduce these ongoing problems in our country, infancy and childhood wrong eating habits during the period should be changed.

SOLUTIONS to NUTRITION PROBLEMS

- Increasing the production of necessary nutrients for baby and child.
- Cheap and nutritious food production for school children
- Cheap and quick delivery of milk and dairy products all over the country
- The milk needs of preschool and primary school children are met free of charge by the state.
- All nutrient-containing foods in childhood are required
- Suppressive / compelling about eating should not be
- Be patient / friendly
- Portions should not be large
- Opportunity and time to eat must be recognized
- Should not insist on quantity
- New nutrients are reproduced at different times must be submitted
- Food presentations should be enjoyable
- Shopping, food preparation, tableware preparing and collecting should attend
- Parents - adults should be consistent, example should behave
- Tasteful - cheerful dinner at the family table eating and social sharing (20).

The mother and father should take part in the nutrition of the child, the rules taught to the child and In practice, the mother and father should be consistent. Warnings about eating while the child is eating warnings about negative behaviors should be made after a meal. The Children positive behaviors should be verbally supported; should not be punished (21). The reward should never be food. Especially the mother and eating habits and attitudes of family members including father should form a model in terms of nutrition. Regular and positive childhood and many adult habits, including eating habits. It should be remembered that there are ages at which the habits are laid (22).

SUGGESTIONS

The most basic in the development of healthy lifestyle one of the principles is sufficient and balanced, in other words to support optimal nutrition. Globalization and changing living conditions. To make it healthy: Increasing nutritional awareness of all individuals and society, Adequate and balanced dietneeds to be converted. İn childhood family members are the main factors that shape the child's eating habits, while the child grows up in the nursery. environment, teachers and friends, outdoor and advertising. Therefore nursing, nursing homes, health care employees, nurses, dietitians and physicians, press and industry and government have responsibility.

REFERENCES

1. T. C. Sağlık Bakanlığı Sağlık Eğitimi Genel Müdürlüğü. (2008). Eğitimciler için eğitim rehberi: beslenme modülü (s. 80). Ankara: İlkay Ofset Matbaacılık
2. Küçükkömürler, S. (2012). Okul öncesi döneminde çocuğun beslenmesi. Anne ve Çocuk Beslenmesi (5.Baskı), (s. 185-191-206). Ankara: Pegem Akademi.
3. Cornah, D. (2006). Feeding minds: the impact of food on mental health. Mental Health Foundation.
4. Alpar F. (2011). Vücut Geliştirme Sporcularında Beslenme, Fiziksel Aktivite ve Besin Takviyesi Kullanım Durumlarının İncelenmesi, Hacettepe Üniversitesi, Yüksek Lisans Tezi, Ankara. SBE. s: 3.
5. Kutlu, R., Selma, Ç. (2009). Özel bir ilköğretim okulu öğrencilerinde beslenme alışkanlıklarının ve Beden Kitle İndekslerinin değerlendirilmesi. Fırat Tıp Dergisi, 14(1), 018-024.
6. Oğuz Ş., Derin DO. (2013). Okul öncesi eğitim kurumlarına devam etmekte olan 60-72 aylık çocukların beslenme alışkanlıkları: öğretmen görüşlerinin değerlendirilmesi. TÜBAV Bilim Dergisi, 6(1), 1-10.
7. Mahan LK, Stump, S.E.(2008). Krause's food & nutrition therapy. 12th edition. St. Louis, Mo.: Saunders/Elsevier.
8. Thomas, B. (2004). Manual of Dietetic Practice. 3rd ed. Oxford, Blackwell Science. 580.
9. Garza, C., de Onis, M. (2004). Rationale for developing a new international growth reference. Food & Nutrition Bulletin, 25(Supplement 1), 5S-14S.
10. Öncü, Ü., Nalbantoğlu, B., Güzel, E., Nalbantoğlu, A., Demirsoy, U., & Çakan,
11. Patrick, H., Nicklas, T. A. (2011). A review of family and social determinants of children's eating patterns and diet quality. Journal of the American College of Nutrition, 24(2), 83-92
12. Butte, N. F., Garza, C., de Onis, M. (2007). Evaluation of the feasibility of international growth standards for school-aged children and adolescents. The Journalof nutrition, 137(1), 153-157.
13. Perry, H., Berggren, W., Berggren, G., Dowell, D., Menager, H., Bottex, E., Cayemittes, M. (2007). Long-term reductions in mortality among children under age 5 in rural Haiti: effects of a comprehensive health system in an impoverished setting. American journal of public health, 97(2), 240-246.

14. Patrick, H., Nicklas, T. A. (2011). A review of family and social determinants of children's eating patterns and diet quality. Journal of the American College of Nutrition, 24(2), 83-92.
15. Öncü, Ü., Nalbantoğlu, B., Güzel, E., Nalbantoğlu, A., Demirsoy, U., Çakan, M. (2007). Long-term reductions in mortality among children under age 5 in rural Haiti: effects of a comprehensive health system in an impoverished setting. American journal of public health, 97(2), 240-246.
16. Black R.E, Allen L.H, Bhutta, Z.A (2008). Maternal and child undernutrition: global and regional exposures and health consequences: 243-60.
17. Sağlık Bakanlığı, Hacettepe Üniversitesi, Türkiye Nufüs ve Sağlık Araştırması (2013). http://www.hips.hacettepe.edu.tr/tnsa2013/rapor/TNSA_2013_ana_rapor.pdf
18. Ersoy G, Rakıcıoğlu N, Karabudak E (2016). Türkiye Beslenme Rehberi 2015 (TÜBER Bölüm 8: Yaşam Sürecinde Beslenmenin Önemi ve Enerji Dengesi. T.C. Sağlık Bakanlığı Yayın No: 1031, Ankara: 101-118.
19. T. C. Sağlık Bakanlığı Sağlık Eğitimi Genel Müdürlüğü. (2008). Eğitimciler için eğitim rehberi: beslenme modülü (s. 80). Ankara: İlkay Ofset Matbaacılık.
20. Kansu, A., Öztürk, Y. (2018). Oyun çocuğu dönemi beslenme rehberi. Türk Çocuk Gastroentoloji, Hepotoloji ve Beslenme Derneği. Ankara; 1-38.
21. Özmert, E,N. (2005). Erken çocukluk gelişiminin desteklenmesi-I: Beslenme Çocuk Sağlığı ve Hastalıkları Dergisi; 48: 179-95.
22. Öztürk Y, Soylu Bekem O. (2017). Pediatride Beslenme. Ankara: Güneş Kitabevi.

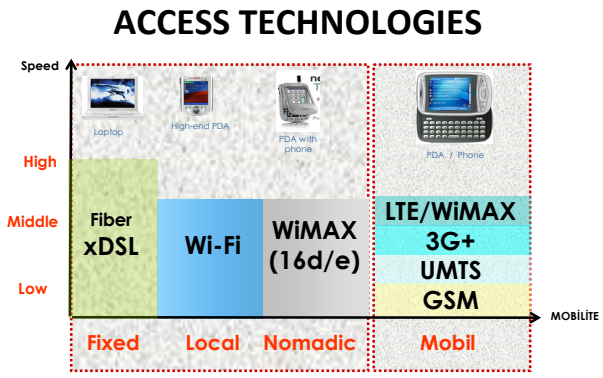
FİXED ACCESS TECHNOLOGIES

Tayfun Acarer[1]

1 ACCESS TECHNOLOGIES

Access is telecommunication infrastructure that serves to end user by using wired or wireless technologies through circuit switched or packet switched systems. Access technologies have 2 grup as fixed and mobile. More than 50% of wired communication infrastructure investments are access infrastructures (Erikson 2019 Global Report, 2020).

Types of access technologies are descirbed below.



1.1. FİXED ACCESS INFRASTRUCTURES

The infrastructure which has been deployed from switchboard to user is called “Access System” Wired access is delivered through Polietilen isolated copper coaxial or fiber optic cables.

Nowadays there is a vast cupper access system especially belonged to main operators. However recently there has been a transformation to optic wired access system in order to promote broadband services. Cables used in access infrastructure are often deployed directly to the soil or reached by overhead pillars. In the metropolitan areas, generally it is deployed to Polietilen (PE) pipe routes in under ground.

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1.1.1. Copper Access Infrastructure

Today while access infrastructures are transforming into fiber optic cable systems, copper wired systems also continue to be used. That is so because there is a great investment to copper wire infrastructure until now. It is economically inevitable to exploit this infrastructure for more time by using new technologies such as ADSL2+, VDSL.

Copper wired access is provided by, gathering the central subscriber cables to interunit (MDF-Main Distribution Frame) and reaching directly to subscriber.

It is calculated by the formula $R = \delta \times l / S$ of the Copper Cable. In this formula;

$R \rightarrow$ Resistance
$\delta \rightarrow$ Resistivity
$l \rightarrow$ Length of cable
$S \rightarrow$ Cross section of the cable
shows.

Accordingly, the resistance of the copper cable; It is determined directly proportional to the resistivity and cable length and inversely proportional to the cable cross-section.

Considering the above formula, when Resistivity increases, Cable resistance also increases. For this reason, it is preferred to use metals with low Resistivity in systems where electricity is transmitted. Currently, one of the metals with the lowest Resistivity in our environment is “Gold”. This is followed by metals such as platinum and silver. However, the fact that these metals are both scarce and very valuable in nature limits their use. On the other hand, copper is still the most preferred material in the transmission of electrical signals, since it is found in large quantities in nature and its resistivity is lower than many mines.

Another important factor in determining the resistance of the Copper Cable is the length of the cable. Especially the attachments made to reach the desired length increase the resistance even more. (In case of addition to the cable, the resistivity increases) For this reason, in case of using copper cable at very long distances, amplifiers called “repectors” are used at certain intervals.

Another important factor that determines the resistance of the copper cable is the cross-section of the cable. The resistance of the cable is inversely proportional to the cross section. In other words, if the cross section increases, the cable resistance decreases. However, if the cable cross-section is increased above the reasonable value, physical and security problems arise. Because when the cable cross-section is increased too much, the cable gets heavier and it becomes very

difficult to transmit it especially as an overhead line. In addition, sometimes it becomes impossible for the cable with a large cross-section to be bent and pulled everywhere. In addition, the risk of the cable being cut and stolen is increasing.

For these reasons, it is possible to say that there are serious limitations in the use of copper cable. Perhaps the most important of these limitations is that if the cable resistance increases, the current value decreases according to the "Ohm's Law". Because according to Ohm's Law Current; It is directly proportional to Voltage and inversely proportional to Resistance.

Ohm's Law; I = V / R.

According to this law, the resistance must be kept as small as possible in order for the current to be large. Otherwise, the Current value will decrease. The decrease in current value is one of the most important problems of electronic circuits. Because a low current means a low signal value. For this reason, it is very difficult to reach high speeds with a low current value. For this reason, it is desired that the current always be at the desired values in electronic circuits.

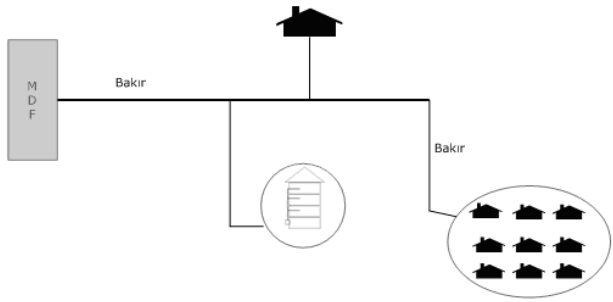


Figure: Cupper Wired Access Infrastructure

Access is provided within the copper transmission limits. Therefore, bandwidth offered to end users is limited with distance and quality of copper wire. Many signal amplifiers can be used depending on the speed needed and the length of the copper cable. The following figure shows the names and domains of different amplifiers in detail (Acarer, T., 2017, s.7). This graphic shows the way of access from the Exchange Center to the Field Cabinet (Fiber To The Curb) and from there to the house as copper.

According to this graph, the most efficient amplifier is "VDSL2" according to the length and capacity of the copper cable. However, it is not an optimal solution to be used everywhere, since its price is much higher than other amplifiers. For this reason, the signal amplifier should be selected by considering the length of

the copper cable and the required data capacity.

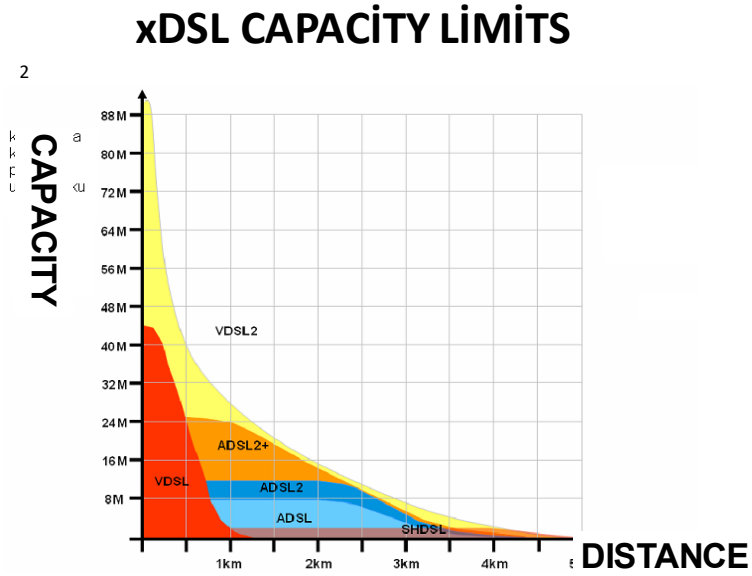


Figure: Distance and Capacity Limits of Different Systems

1.1.1.1. Structure of Copper Cable

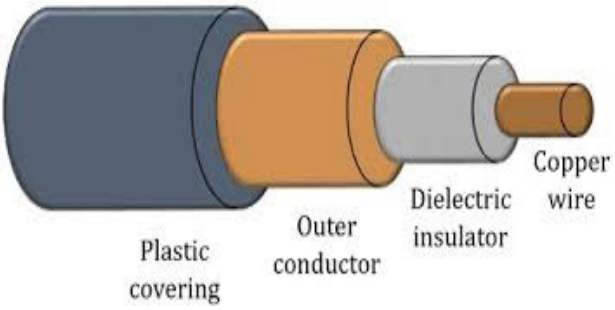
Copper wire; In its simplest form, it is a cable covered with plastic. Generally, two cables are used together. This pair of wires is called a "pair". When a large number of copper wires are together, they form the wiring harness. Such multiple copper cables; 10 pair, 20 pair, 50 pair, 100 pair, etc. are mostly used as double wired. The ends of these copper cables are color coded so that they do not interfere during the connection. Therefore, when multi-pair copper cables are produced, they benefit from standard color codes and subscriber connections are provided without confusion.

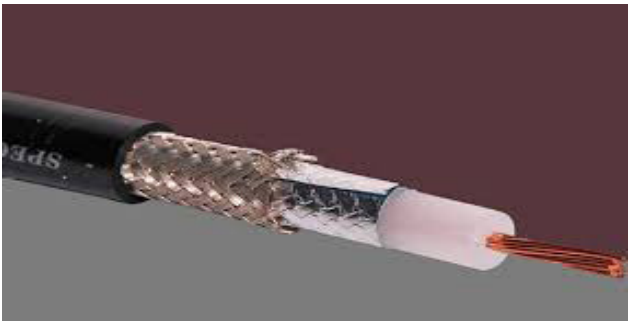
The different types of multi-pair copper cables are shown below. These cables have a protective sheath made of thick plastic. Especially when multiple copper cables are pulled over the overhead line, a steel rope is also installed inside the outer armor of the copper cable in order to increase the strength of this cable and to make it easier to hang on the hanger.

1.1.1.2 Coaxial Cable

Coaxial cable; They are cables that carry electric current, which are covered with an insulating material and used in the fields of electricity and electronics, and are formed by placing one or more metallic conductors inside. Coaxial cable is a type of copper cable used especially in environmental conditions where electrical noise is intense.

Coaxial cables have conductive copper at the center. This live terminal carries the electrical signal. Outside of this copper cable, there is an insulating layer with a high dielectric constant. This layer is covered with an aluminum or copper braided armor. There is an insulating plastic outer cover on the armor. Thanks to this structure of the coaxial cable, the signal carried on the central conductor is prevented from being affected by electrical noises.





Coaxial cables have a high capacitance value. Areas where coaxial cables are used; Television is CATV (Community Antenna Television), telephone networks and local area networks. Although these cables are used in long-distance telephone networks, they have been replaced by fiber optic cables and satellite systems in recent years. Today, coaxial cables are used in television and camera systems. For this reason, coaxial cable is generally preferred for the transmission of high frequency signals of telephone, television and radios.

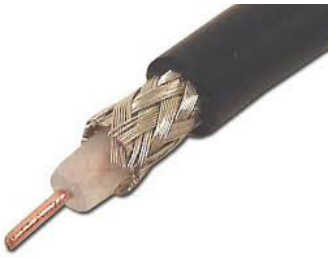
Today, coaxial cables are used in residential, commercial and industrial facilities for data transmission. Discovered in the early 1930s, coaxial cables have been used since the beginning of the 1940s. Coaxial cables have a data transmission capacity and high bandwidth about 80 times faster than twisted wires. They provide more protection against electrical noise and impacts. Coaxial cables can carry both analog and digital signals. Coaxial cables are also preferred in cable TV broadcasts due to their high bandwidth.

The dense metal shield, which acts as a shield against electromagnetic radiation in the coaxial cable, forms a flexible cylinder around the inner cable. This shield provides two ways to insulate the inner cable.

- It protects the cable from the electromagnetic field that can cause interference and ensures that other cables are not affected by the electromagnetic field produced by the inner cable.

- Since the cable in the center is constantly protected by the outer shield in the

same way and at a distance, it is not affected by bends or twists in parallel laying and corners.



Coaxial cables are generally a type of cable developed to transmit low-power signals in areas with a lot of electromagnetic pollution. There are many different types of coaxial cable. In computer networks, they can communicate over longer distances without requiring a repeater, compared to Unshielded Twisted Pair (UTP) and Shielded Twisted Pair (STP) cables.

1.1.2 Fiber Optic Cabled Fixed Access Infrastructures

Parallel to technological developments in the telecommunication field; voice, data and image services are varied and need for capacity is increased. Bakır kablo, hatta coaxial kablo bu büyüyen kapasiteyi karşılamakta artık yetersiz kalmaya başlamıştır. In particular, the increase in the capacity and speed of the data used has necessitated the use of other communication tools other than copper cable in access.

Therefore today, to offer broadband services such as plural medium, high capacity data, video applications and IPTV; access infrastructure has to be amended. In this context, there has been a transformation from copper wire to fiber infrastructure. For this reason, today, the use of fiber optic cable has become mandatory in the connection of many systems that require high data rate and capacity.

Fiber Cabled Access System (FTTx) is delivered through Fiber to the Curb (FFTC), Fiber to the Home/Building (FTTH/B) methods. In the table below, the different structures of these access types and the connection types between the switchboard and the curb, the building, and the house are shown separately (Erikson 2019 Global Report, 2020).

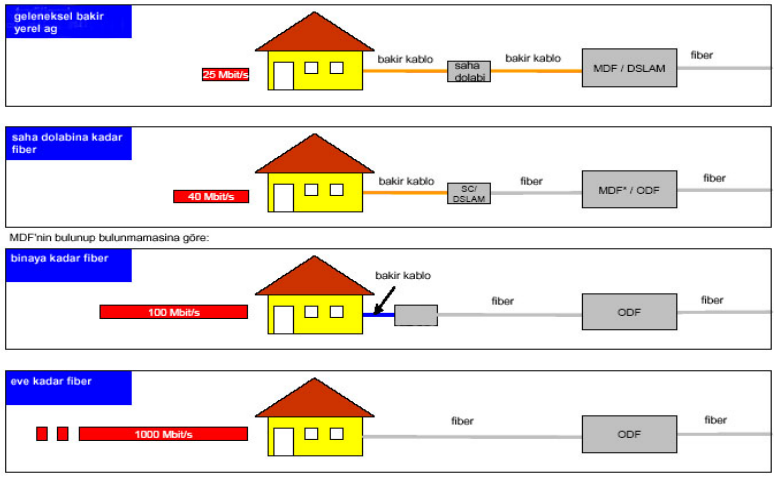
Fiber to the Curb (FFTC) methods; It is the form of access which is Fiber Optic Cable from Exchange Center to Curb and Copper Cable from Curb to building.

Fiber to the Building (FTTB) methods; It is the type of access which is Fiber Optic Cable from Exchange Center to the Building and Copper Cable from the entrance of the building to the house (inside the apartment).

Fiber to the Building (FTTH) methods; Fiber Optic Cable from the Exchange Center to the house (inside the apartment) and a Copper Cable from the entrance of the house to the house.

Fiber to the Building (FTTT) methods; It is the type of access which is Fiber Optic Cable from Exchange Center to the house (inside the apartment) and Fiber Optic Cable from the entrance of the house to the desk (where the computer is).

ACCESS TO FIBER APPLICATIONS



Additional from basic telecommunications services, FTTx systems can be used for,

- Video (Real Time Analog and Digital TV Broadcasting), more than 150 IPTV channels,

PPV (Pay Per View -), HDTV (High Definition TV-),

VoD (Video On Demand) telephony and real time multiple medium (local, long distance services and advanced telephony features) and

- IP based communication services can be used.

Again, different fiber cable access types are shown in detail below. (Acarer, T., 2017, s.11)

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3

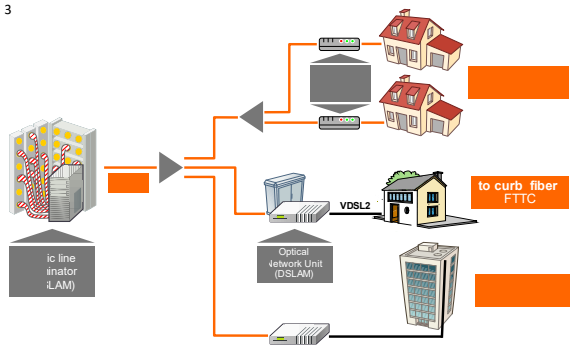


Figure: Different FTTx Connections

1.1.2.1 Fiber to the Curb (FTTC) Method

This method means deploying fiber until the curb. For this fiber connection Metro Ethernet and SDH technologies are used. Still it can be used copper wire between end user and the curb. It is possible to reach high band width (32 Mbit/sc) by applying FFTC system topology as shown in the diagram above.

On the central side, reaching the fiber optic cable and ending in the end user ith copper wire 32 Mbit/sc (ADSL2+, VDSL) is possible. The outline of the "FTTC topology" is shown below.

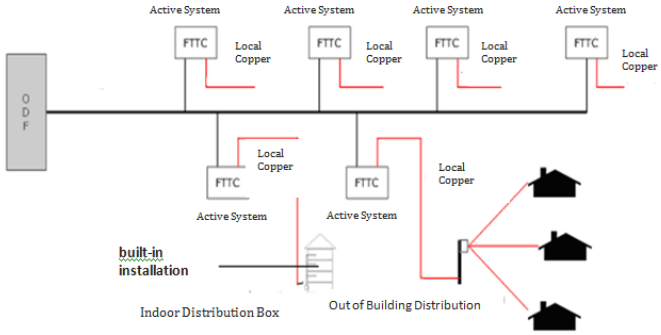


Figure: FTTC topology

1.1.2.2 Fiber to the Home/Building Method (FTTH/B)

FTTH is a method that serves optic solution until the end user. Broadband access is completely based on fiber optic.

Therefore internet and data access speed can reach to 1 Gbit for end user. Recently, old cupper cables are substituted with optic cables from center until the curb.

FFTH/B method is used two methods either as P2P (point to point) or PON (Passive Optic Network).

In P2P method, each user is allocated with at least two fiber peer to peer that is to say no sharing problem.

In the PON architecture, shared optic is used until the curb and ODF. After a splitter in the curb in the field, each customer uses allotted fibers. The outline of the “FTTB/H topology” is shown below.

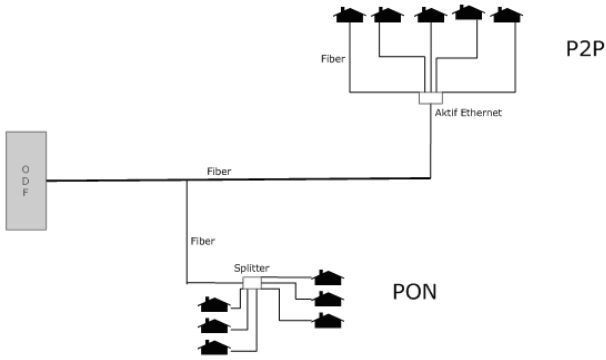


Figure: FTTH/B topology

1.1.2.3 Fiber Cable Types

There are three main types of fiber optic cable.

- Glass Fibers: Its core and cover are made of glass. It shows the best performance in terms of data transmission. The glass used in its construction is ultrapure silicon dioxide or quartz crystal.

- Plastic Coated Silicon Fiber: They have a glass core and a plastic sheath. It is cheaper in price than glass fibers, but more inefficient in terms of performance.

- Plastic Fibers: It is the cheapest type of fiber. Both the core and the cover are plastic. It is the most suitable fiber with the weakest performance and generally does not have coatings. It is suitable for short distance communication.

1.1.2.4 Advantages Of Fiber Optic Cable

- Wide bandwidth: The bandwidth of fiber optic cables is much higher than metal cables and can carry much more data.

- Electromagnetic immunity: Fiber systems are not affected by crosstalk between cables caused by magnetic induction. Glass or plastic fiber cables are materials that do not conduct electricity. For this reason, there is no magnetic field created by the current flow in fiber optic cables.

- No interference (Diaphony); Fiber cables are not affected by static interference caused by lightning, electric motors, fluorescent light, and other electrical noise sources. One of the reasons for this is the electrical conductivity of fiber optic cables. Also, fiber cables do not emit energy.

- Resistance to environmental conditions: Fiber cables are more resistant to large changes in environmental conditions.

- Facility convenience: Installing fiber cables is easier and safer to maintain. Fiber cables are smaller and lighter than metallic cables. Fiber cables are not susceptible to interference, as the signals are optical, not electrical.

- Reliability: Fiber cables are safer than copper. It is impossible to make an illegal or hidden connection inside the fiber cable without the knowledge of the user.

- Cost; The long-term cost of a fiber system is less than the long-term cost of a metallic system.

- Lifetime: Fiber optic cables are long-lasting and can be used for 20-50 years.

1.1.2.5 Disadvantages Of Fiber Optic Cable

- Difficulties arise in setting it to the existing network. (mismatch of copper circuit and fiber)

- Mismatch of digital and analog systems.

- Since the need for fiber optic cables in local networks is not high, equipment development studies to be used in local networks are carried out gradually. Existing equipment is very expensive.

The first establishment process, which constitutes the subject of rights of way in the electronic communication sector, means the establishment of the F/O infrastructure. For this reason, investments in fiber infrastructure and fiber topologies gain great importance. Considering the installation and maintenance of F/O infrastructures on a cost basis, operators may have to bear serious costs due to the installation costs required for the cable and hardware required at the point of establishment of the infrastructure. However, considering that prospective fixed infrastructures will be shaped within the framework of broadband services based on F/O technology, it is thought that these costs should be borne in any case.

Today, parallel to the technological developments in the field of telecommu-

nications, voice, data and video services have diversified and grown and the need for capacity has increased. As a result, today's access infrastructure needs to be established in accordance with the purpose of providing broadband services such as multimedia, high-capacity data, video applications and IPTV.

In this context, conversion from copper cable to fiber infrastructure has been initiated in many developed countries in recent years. Fiber cable access system (FTTx);

Fiber To The Curb (FTTC- Fiber To The Curb),

Fiber to the Building (FTTB) and

It is applied with Fiber To The Home (FTTH) methods.

When we look at the cost items of the investments of the P/O infrastructure, it is seen that a very serious rate arises from the construction/excavation operations. Other similar construction and manufacturing operations, especially excavation and canal operations, constitute almost 80% of the cost expenses.

1.1.2.6 Commissioning of Fiber Infrastructure

Although average values are given here, factors such as the size of the settlement and population density may cause the rates to change.

As can be seen from the chart above, in addition to the construction operations, commissioning operations to be carried out in the end-user households constitute the vast majority of cost items.

Operators providing electronic communication services do not only invest in P/O infrastructure, but there may also be other institutions such as companies providing public services and local municipalities among potential investors. In addition, businesses that currently provide other infrastructure services such as electricity, water and natural gas also establish F/0 infrastructure in their existing infrastructures and thus have the opportunity to develop their commercial activities. Since such institutions do not have sufficient sectoral knowledge and experience, they generally choose to partner with operators providing electronic communication services.

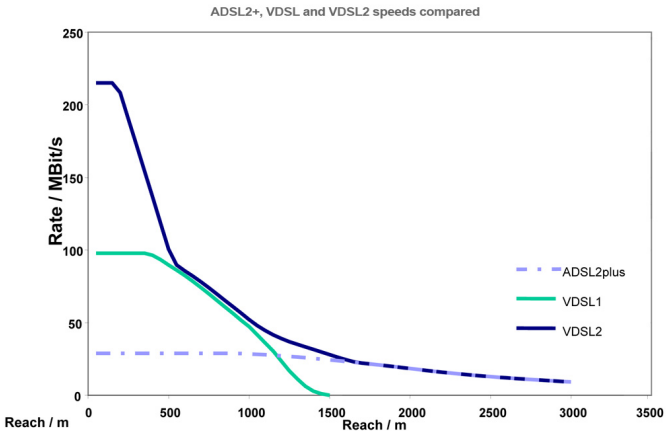
The goal here is to pull the Fiber Optic cable through a suitable shield. For this reason, it is aimed to benefit from the infrastructure opportunities of the companies that carry out different canal excavations to the maximum extent. In this way, it is possible to install and install the fiber cable in a safer environment, and it is ensured that it is operated by the operator with a cheaper cost. For this reason, in recent years, collaborations and consortia in accordance with rental or revenue sharing models have been made between companies that provide such infrastructure services and operators operating in the IT sector.

1.1.2.7 Distance Dependency of xDSL Technologies

xDSL technology is used in Fiber To The Curb (FTTC) access method. In this type of access, after fiber cable is used from the switchboard to the field cabinet, copper cable is installed from the field cabinet to the buildings and houses. The length and cross-section of the copper cable between the cabinet and the buildings determine the level of the signal coming into the building. Because the cross-section of the cable and the additions made to it also increase the resistance of this cable. Because if the cross-section of the copper cable is thin and the length of the cable is long, the resistance of the cable will increase. Again, breaking of this copper cable for different reasons over time is another reason that increases the cable resistance.

The increase in the resistance of the copper cable will reduce the current flowing through the circuit due to Ohm's Law explained above. (Because the resistance and current are opposite according to Ohm's Law) In this case, different features such as ADSL+, VDSL, VDSL2 etc. necessitates the use of amplifiers. These amplifiers are determined according to different cable lengths and different data capacities, and monthly usage fees vary according to their features. Accordingly, the amplifier with the highest capacity value and operating with the longest cable length will naturally be the most expensive in terms of price.

In line with these evaluations, it is possible to say that VDSL2 is the most expensive amplifier according to the graph below.

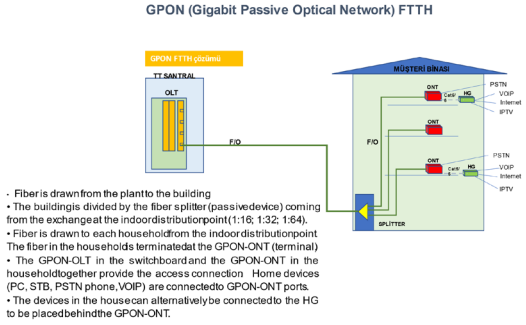


1.1.2.8 Gigabit Passive Optical Network (GPON)

GPON Technology is passive optical networks. The figure below describes the previously described “Fiber to the Home - FTTH” access method. In this structure, it is used with Fiber Optic cable from the switchboard to the house. In the house, since different systems and devices need internet, these systems are connected with copper cable by using a “multiplexer” for services such as VoIP, PSTN network, internet and IPTV.

Since the signal is brought to the house via Fiber Optic cable in the GPON system, attenuation in this form of access is minimal. However, attention should be paid to the resistance of the multiplexer to be used inside the house to the system. Since the resistance of a multiplexer made of bad material will be large, it is inevitable that this will have a negative effect on the circuit current and thus the signal level.

In addition, since the thinness of the copper cable used to access different devices in the house, its breakage over time and the splices made as a result, will increase the cable resistance, the condition of this cable is of great importance for good access. For this reason, it is a more accurate method to use coaxial cable instead of normal copper cable in the distribution of the signal in the house.

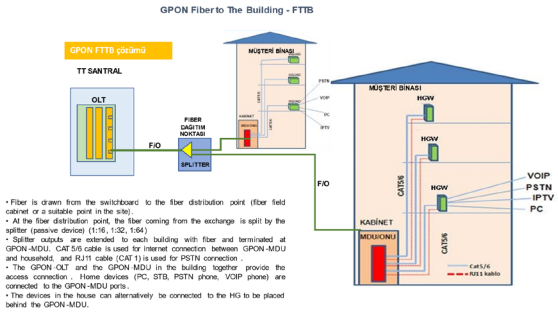


Again, the figure below shows the example where a Fiber Optic cable coming out of the switchboard is brought to the building (Fiber to the Building), and then communication is provided inside the house with a copper cable. Many buildings around us still have the following network structure. In other words, fiber connection is provided up to the entrance of the building, and copper cable is provided inside the building.

In this type of access, the structure and quality of the systems and connection

elements inside the panel, which is generally called the “Distribution box” inside the building, is extremely important. The said Distribution Box usually includes an Amplifier, Light / Electric Converter (Converter) and Signal Multiplexer (Multiplexer). The quality of these systems has a very important role in determining the resistance of the circuit. In addition, the cross-section and seamlessness of the copper cable coming out of the Multiplexer and drawn to the flats (houses) have a very important role in determining the resistance to the signal.

If the copper cable between the Distribution Box and the houses is thin, broken over time and added at many points and the insulation is broken in this way, the resistance of the cable will increase in these unfavorable situations. In all these negativities, it is inevitable that the current value of the signal will decrease and accordingly the signal will deteriorate. Since the desired speeds cannot be reached in such an access, ADSL, VDL, etc. The use of signal amplifiers is inevitable.



2. FIXED ACCESS INFRASTRUCTURE IN TURKEY

2.1 FIXED NUMBER OF SUBSCRIBERS AND PREVALENCE IN TURKEY

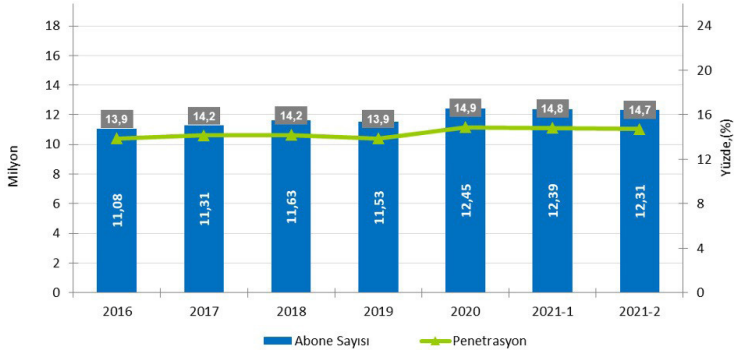
The chart below shows the last six years’ values regarding the Number and Prevalence of Fixed Subscribers in Turkey. (Bilgi ve İletişim Kurumu 2021 2. Çeyrek Raporu, 2021, s.34) Considering the data of the second quarter of 2021 from 2016, it is understood that there is not much increase in the number of Fixed Subscribers and there is no expansion accordingly. These values are generally valid for all countries in the world, and similar proportional values are observed in other countries.

According to the values of the second quarter of 2021, the number of fixed telephone subscribers reached 12.3 million in Turkey. Fixed Broadband subscribers, on the other hand, exceeded 17.4 million. Currently, 11.3 million of Fixed Broadband subscribers are xDSL and 4.3 million of them are Fiber Subscribers.

These data show that the number of fixed broadband subscribers is much higher than the number of fixed telephone subscribers. This point shows that some of the fixed broadband subscribers are not fixed telephone subscribers.

Again, this data is the Fixed Subscription; It shows that it is made for fixed internet subscription and fixed broadband service rather than fixed phone calls. Because, in this process, it has been determined that fixed voice service has been decreasing gradually, whereas fixed broadband data service has maintained its value in recent years in terms of proportional and subscriber numbers, and there has even been a slight increase.

million %



**** Number of Subscribers*** **** Penetration***

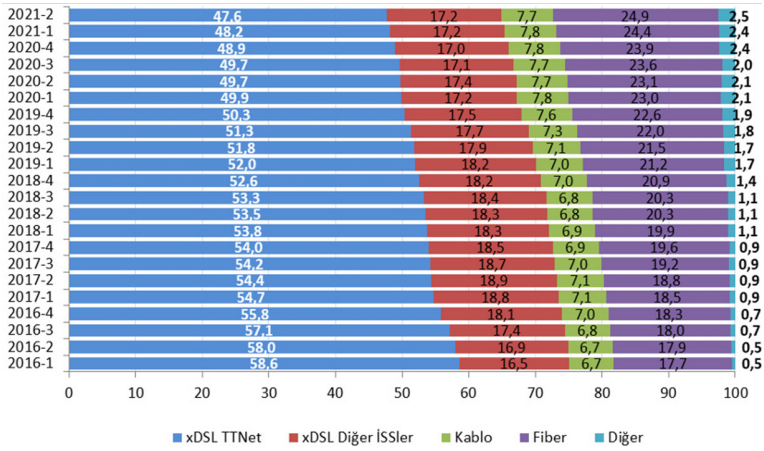
2.2 AVERAGE USAGE AMOUNT PER SUBSCRİBER MONTHLY (GBYTE) İN TURKEY

The graph showing that Fixed Broadband is becoming increasingly widespread in Turkey and the data on it is increasing every year is given below. (Bilgi ve İletişim Kurumu, 2. Çeyrek verileri, 2021, s.56). It is possible to make two important observations on this graph. The first of these; The market share of TT-Net, the Internet Service Provider of Türk Telekom, which is the largest Internet

Service Provider in our country, is gradually decreasing compared to Alternative Service Providers.

Other important determination; The share of Fiber fixed access in all access systems is increasing every year, even every quarter. As a result, the rate of Fiber Optic cable usage in fixed data access increased by more than 7% in the period of 2016 - 2021 and reached half the rate of "xDSL" usage.

According to the data of the second quarter of 2021, the monthly average data usage amount of fixed broadband internet subscribers in Turkey is 211 Gbytes



* xDSLTTNet * Other ISPs * Cable * Fiber * Other

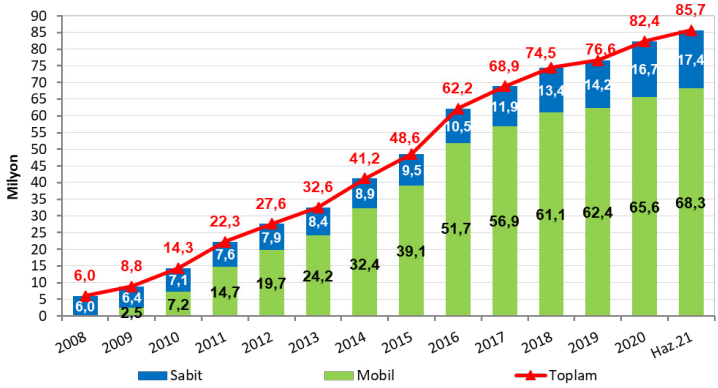
2.3 NUMBER OF INTERNET SUBSCRIBERS IN TURKEY

It is natural that the number of fixed internet subscribers is less than the number of mobile internet subscribers, or even a quarter proportionally. Because the fixed internet subscription is parallel to the number of households. In other words, the number of fixed internet subscribers can be as much as the number of households. However, the number of mobile internet subscribers is directly related to the number of mobile subscribers and is naturally much higher than the number of fixed internet subscribers.

In the chart below, the number of internet subscribers according to connection types in Turkey and the quarterly and annual increase rates are given (Bilgi ve İletişim Kurumu, 2. Çeyrek verileri, 2021, s.49). As of the second quarter of 2021, there was an increase of % 2.1 in total internet subscriptions compared to the previous quarter. Especially with the increase in fiber, cable and xDSL internet subscribers, the general increase trend in the number of internet subscribers continu-

ed. The annual rate of increase in the number of internet subscribers was % 9.3.

Again, it is seen from this chart that while the number of internet subscribers in Turkey was 6 million in 2008, it reached 85.7 million subscribers in the second quarter of 2021. According to these values, the amount of increase in the last twelve years has been approximately eighty million new subscribers. This increase rate is also very high among OECD countries, and proportionally, Turkey is defined as one of the countries with the fastest increase in internet subscribers among the world's countries.

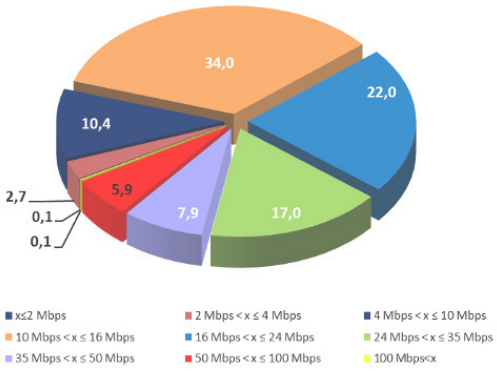


- Fixed *Mobil * Total

2.4 PERCENTAGE OF FİXED BROADBAND INTERNET SUBSCRİBERS BY SPEED İN TURKEY

The number of broadband data subscribers in Turkey according to different data rates and their related rates are given in detail in the chart below. As can be seen from this chart, according to the data of the second quarter of 2021, 34 % of fixed broadband subscribers in our country use data rates between "10 and 16 Mbps". Fixed broadband subscribers using "16 – 22 Mbps" speeds come second with a rate of 22 %. In the third place are fixed broadband subscribers using "24 – 35 Mbps" speeds.

These three speed ranges constitute approximately three-quarters of fixed broadband internet subscribers in Turkey in terms of speed. On the other hand, the rate of data speed values of 50 Mbps and higher, defined as very high fixed broadband speeds, exceeded 6%.



2.5 MARKET SHARES OF FİXED TELECOM OPERATÖRE (STH) BY NUMBER OF SUBSCRİBERS İN TURKEY

There has been a serious increase in Turkey's fiber infrastructure in recent years. Fiber length, which was 404.308 km in total in the second quarter of 2020, reached 445,390 km in the second quarter of 2021, an increase of approximately 10.2% (Bilgi ve İletişim Kurumu, 2. Çeyrek verileri, 2021, s.36). This rate represents much more than the rate of increase in Fiber Optic cable length in many countries.

Market shares of fixed telecom operators in Turkey are shown in the table below. As can be seen from this table, "TTNet" ranks first in the fixed market with a share of 76%. The share of TTNet is considerably higher than other operators and it dominates the Fixed Telecom Operator (STH) sector on its own.

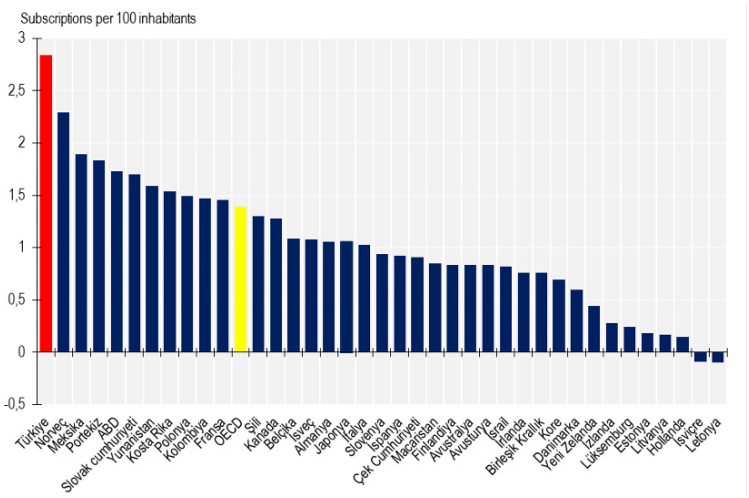
Again, according to the table below, within the fixed telecom operators market shares, "Türksat" ranks second with 5.9% fixed subscriber rate, and Türknet ranks third with 2.9% share. These top three operators are followed by "Süperonline", which has a 2.4% market share and is a subsidiary of Türcell.

Operators	Pazar Payı (%)
TTNet	76,0
Türksat	5,9
Turknet	2,9
Superonline	2,4
İş Net	2,2
NetGSM	2,1
Voip	1,3
Vodafone Net	1,1
Millenicom	1,0
Diğer	5,2

2.6. FİXED BROADBAND AVAİLABİLİTY GROWTH RATES İN PERCENTAGE OF OECD COUNTRİES

The increase rate of fixed broadband usage within OECD countries is shown in detail in the chart below. (Bilgi ve İletişim Kurumu, 2. Çeyrek verileri, 2021, s.52) When we look at this graph, considering the percentage increase in fixed broadband usage among OECD countries, Turkey is seen as the country in the first place. Our country has a growth rate of approximately 2.8%, almost twice the average increase rate of OECD countries. Considering this increase rate in 2021, it is possible to say that Turkey has a much higher fixed broadband availability increase rate than many countries such as Germany, United Kingdom, Japan and France.

The countries following Turkey in fixed broadband usage in OECD countries are Norway, Mexico, Portugal and the United States, respectively. Together with Turkey, these countries constitute the first five countries in the use of fixed broadband in the OECD. On the other hand, there is a negative increase in fixed broadband usage in countries such as Switzerland and Latvia.



Kaynaklar

Acarer, T., Bilgi ve İletişim Sistemlerinde Eğilim Kitabı, Boyut Yayıncılık ve Tic. A.Ş, Sertika No:10855, ISBN:978-975-23-1200-5, İstanbul, 2017.

Bilgi ve İletişim Kurumu, Türkiye Elektronik Haberleşme Sektörü Üç Aylık Pazar Verileri Raporu, 2021 (2. Çeyrek Raporu)

Erikson 2019 Global Report, 2020.

Leadership Types for Workplace Innovation and Career Satisfaction: The Mediating Role of Individual Creativity

Ece Kurtuluş[1]
Emre Burak Ekmekçioğlu[2]

INTRODUCTION

Workplace innovation represented as the changeable and social approach on the workplace's development and improvement in the manner of every manage-rial skill and techniques differed on employees. (1) Through this meaning, it is claimed that workplace innovation and leadership techniques for innovation can show various aspects upon cultural considerations. On that point, the research is lead through social gather of the leader and the employee within workplace. (2) The need of technological improvement and the need of responsibility division through employees can be affected by leadership types for workplace innovation and that affect may also take place in the cultural aspect of workplace. (3)

Workplace innovation is a key approach in a structure of an organization which also represents a social aspect of employees (2). Since the social aspect of the research is consisted through workplace innovation, the leadership elements and approaches on workplace innovation represent the traditional and updated practices. (4) The bullet point of innovative leadership on individuals, individual creativity (IC), emphasized through its factors of impacts on individuals within an organization. (5)

Wipulanusat et al. informed that transformational leadership (TL) and consideration leadership (CL) are the types of leadership that should be considered at the forefront for innovation in the workplace. (6) The concept of TL has been attracted by organizations for implementation and understanding of leadership effects on followers and organizations. TL is to get people motivated sustainably and organizations strengthened and get transformed. (7) As evidenced by prior research, TL dimensions such as influencing, motivating, consideration or stimulating are positively related to both organizational performance and career satisfaction. (8)

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Within the context of CL, there are basic attitudes that took place in literature as well with the behaviors such as strong relations, close interpersonal relationships, self-worth through positive regarding from others, and motivating in the beneficial relationship as work partners and providing social support. Given behavioral examples consistent with CL, are the basic approaches on showing concern, respect to the followers, being aware of the needs and providing support constantly. (9)

This study has emerged from the curiosity aroused through Wipulanusat et al., which the study was generated through workplace innovation and career satisfaction (CS). (6) Employees who have higher IC scores tend to examine and evaluate the opportunities for new, improved and developed products. (10) Futher, those employees are not only more likely to find better creative settlements, but also, they have developed ideas and applications. (10) IC, in which the general assumption of this indicator is mentioned as the creativity show a relation between the self-efficacy as well. (5) Hence, individual creativity can be a key point as a mediator in the relationship between leadership types for innovation and CS, in the sense of cultural attempt on employees.

There is lack of evidence about the relationship between the leadership types that support the innovation process and CS, specifically for engineers working in the technology development zones. A country's ability to innovate is a crucial factor in its economic success, and the engineering profession is regarded as a vital driver of innovation. (11) Thus, engineers play an important role in the invention, development, and generation of new technological information. (12) The goal of the present article is to explore the relationship between leadership, creativity, and career success. For this purpose, we tested that whether IC

shows a mediation role in the relationship between leadership types for innovation (TL and CL) and CS (see Figure 1). Comprehension of these relations will support managers in developing strategies for attracting and maintaining a high-performing engineering employees by promoting workplace innovation in technology development zones.

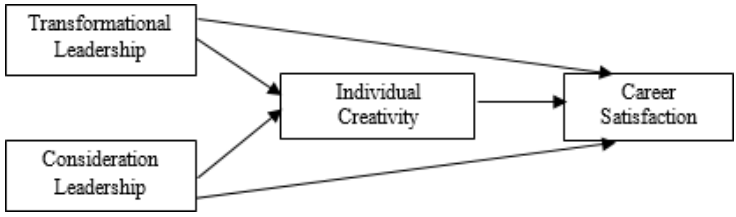

Figure 1. Proposed Theoretical Model

LEADERSHIP FOR WORKPLACE INNOVATION AND CS

TL and CL are the forms of leadership that should be prioritized for workplace innovation. (6) Bass and Avolio developed an exact definition of transformational leadership that combined individualized consideration (mentoring), idealized influence (charismatic role modeling), intellectual stimulation (encouragement of creativity and innovation), and inspirational motivation (expressing an appealing vision). (13) Transformational leaders exhibit charisma, inspire others, and foster intellectual stimulation. (14) Transformational leaders also have the qualities that are crucial for creating an innovative work environment and inspiring their followers by driving them to learn and build innovation. (15) Accordingly, TL demonstrates that it is a sort of leadership required to foster employee innovation. (16)

In addition to TL, CL is critical to the success of innovation. (17) TL has beena contribution on consideration and initiating planning on various behavioral outcomes, where CL has been aroused as a dominant expression of considerational attitudes in TL. (18) Consideration leader behaviors generate a supportive care, kindness, and trusting atmosphere for followers. (6)

CS is considered as an employee's feeling of satisfaction or dissatisfaction for their whole career. (19) Employees' careers are likely to be enriched by supportive relationships with their supervisors, and career performance will likely relate to leading approaches. (19) In organizational structures, it is unavoidable that employees seek to have the CS in the senses of demographic structure, organizational commitment, and their focus on achievement. (20) The leadership approaches on workplace innovation slightly touches on the aspects of social construction whereas the leadership types (TL and CL) and CS should be estimated as together. Studies show that TL (21, 22) and CL (6) positively related with CS. Consequently, within the mentioned aspects, we get the point of where we will be claiming as Hypothesis 1a and Hypothesis 1b.

H1a: Transformational leadership for workplace innovation positively relatedto career satisfaction.

H1b: Consideration leadership for workplace innovation positively related to career satisfaction.

IC AS A MEDIATOR

IC entails developing practical and novel answers to workplace difficulties,as well as producing concrete and beneficial results for an organization. (23) IC is a necessary but insufficient condition for successful organizational innovation, which in part can be driven by other factors. (5) IC factors relate to general perso-

nality, big five personality, and self-perception. The five subareas under external influences include creativity goal setting, evaluation and feedback, teamwork, role models, and leadership and supervision. Also, the main aspects surrounded through the IC's setting on the one where aesthetic sensitivity, attraction to complexity, broad interests, intuition, and toleration of uncertainty. (24) The reason of the IC was predicted to be the mediator variable of current studyis that IC is one of the main aspects in organizational structures especially as in the firms that individual success brings the complete success. The work environment has an impact on IC and motivational content which should be emphasizedthrough a leadership type and individual or group basis research. (25) Employeeenthusiasm also create an attachment to the employee's objectives, and this is thepoint where we can count as a significant aspect on individual creativity arouse. (26). To conclude given all aspects on the issue, the Hypothesis 2a-b emerged where we can point the notion of workplace innovation in social aspect of employees.

H2a: Individual creativity mediates the relationship between transformation-al leadership and career satisfaction.

H2b: Individual creativity mediates the relationship between consideration leadership and career satisfaction.

RESEARCH METHOD PARTICIPANTS AND PROCEDURE

Data for this study were collected from employees working in technology development zones (TDZz) in Ankara, Turkey. TDZz, also called techno-centers and technoparks, are the research and development zones for technical innovation. (27) There are currently active eight TDZz in Ankara, according to data from the Republic of Turkey's Ministry of Industry and Technology. (28) We designed the surveys using both paper and pencil and an online platform to increase survey response. Participants were given the option to choose their preferred survey mode. Further, the surveys included a cover letter in which respondentswere assured of their anonymity and confidentiality. Protecting respondents' anonymity helps to reduce both assessment apprehension and response bias. (29) The survey was given to 382 employees who returned 187 questionnaires, yielding a response rate of 48.95%. Based on demographical characteristics, respondents were 63.1 percent male, with an average age of 28.67 years (ranged from 23 to 45 years) and an average organizational tenure of 3.93 years (ranged from 2 to 12 years).

MEASURES

Except for the control variables, all elements in the measurement scales listed below were responded on a 5-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). Prior to data collection, as the original scales were written in English, back translation procedure was conducted (30) to createa Turkish version.

Leadership for innovation

Leadership for innovation was measured using a six-item TL scale (e.g. "Your immediate supervisor's action achieves results.") and a five-item CL scale (e.g. "My supervisor treats people with respect."), based on the study of Wipulanusat *et al*. (6) Cronbach's alpha value for TL scale and CL scale was 0.94 and 0.82, respectively.

Individual creativity

IC was measured using five items (e.g. "I have the freedom to decide how my job tasks get done") developed by Houghton and DiLiello. (5) Cronbach's alpha was 0.88.

Career satisfaction

CS was measured using five items (e.g. "I am satisfied with the progress I have made toward meeting my goals for the development of new skills.") deve- loped by Greenhaus *et al*. (19). Cronbach's alpha was 0.91.

Control variables

Gender, age (31, 32, 33), and organizational tenure (34) were included as cont-rol variables in this study because prior studies have indicated that these demographic characteristics have the potential to affect employees' career satisfaction.

RESULTS

COMMON METHOD VARIANCE

Following Podsakoff *et al.* (29), Harman's one-factor test was used to test common method variance. The unrotated exploratory factor analysis performed with the one-factor solution explained only 44 percent (below the 50 percent cutoff) of the total variance, indicating that it was not a dominant factor in the study. The findings of Harman's one-factor test revealed that common method variance was not an issue.

MEASUREMENT MODEL

Prior to examine the structural model, a series of confirmatory factor analysis (CFA) was conducted to ensure discriminant validity of the items of each construct in this study. To demonstrate how well the model fitted our data, $\chi 2$ (chi-square discrepancy)/df (degrees of freedom), standardized root mean squared residual (SRMR), root mean square error of approximation (RMSEA), Tucker–Lewis index (TLI), comparative fit index (CFI), and incremental fit index (IFI) fit indices were computed. (35) The fit indexes demonstrated that the four-factor (hypothesized) model provided acceptable fit to the data (χ^2/ df = 410.39/179= 2.29, p<0.001, IFI = 0.92; TLI = 0.93, CFI = 0.93, RMSEA = 0.08, SRMR = 0.07). As depicted in Table 1, the four-factor hypothesized model was also compared to alternative ones. Alternative models provided a considerably worse fit than our hypothesized four-factor model, indicating that all variables in this study are distinguishable.

Table 1. Comparison of alternative measurement models.

Models	χ^2	**(df)**	χ^2 / **df**	**RMSEA**	**IFI**	**TLI**	**CFI**	**SRMR**	χ^2 **diff.**
Four-factor (hypothesized)	410.39	179	2.29	0.08	0.93	0.92	0.93	0.07	-
Three-factor (merged TL and CL)	492.06	182	2.70	0.10	0.90	0.89	0.90	0.09	81.67***
Two-factor (merged TL, CL, and IC)	831.47	184	4.51	0.14	0.80	0.77	0.80	0.11	421.08***
Single factor (merged all constructs)	1196.36	185	6.46	0.17	0.69	0.65	0.69	0.12	785.97***

Note(s). n =187, ***$p < 0.001$, χ^2diff.: difference in chi-square, TL=Transformational Leadership, CL=Consideration Leadership, IC = Individual Creativity, CS= Career Satisfaction; All models compared to four-factor hypothesized model.

A CFA was performed for the four-factor hypothesized model provided evidence for evaluating convergent and discriminant validity and composite reliability. The findings revealed that all the items loaded significantly ($p < 0.001$) ontheir respective constructs (>0.50). Table 2 shows that the composite reliability (CR) for all variables exceeds the cutoff value of 0.70. The average variance extracted (AVE) values obtained in this study for the TL, CL, IC, and CS constructs were 0.72, 0.47, 0.63, and 0.67, respectively. Only the AVE value of the CL construct is less than the threshold of 0.50. Fornell and Larcker (36) pointed out that even if AVE score is less than 0.50 but composite reliability is greater than 0.6, the construct's convergent validity is still adequate. Furthermore, the CR values for each of the four constructs are greater than the AVE values (CR >AVE),indicating convergent validity. (37) As shown in Table 2, the square roots of theAVE scores for each construct is greater than the correlations between each pairof constructs, indicating discriminant validity. (37) These findings suggested thatconstruct validity and internal consistency were adequate.

Table 2. Correlation Analysis

Variable	Mean	S.D.	CR	AVE	1	2	3	4	5	6	7
1.Gender	1.63	0.48	-	-	-						
2.Age	1.99	0.76	-	-	0.14	-					
3.Tenure	2.10	0.84	-	-	0.21**	0.83**	-				
4.TL	3.94	0.96	0.94	0.72	0.02	0.15*	0.19**	**(0.85)**			
5.CL	3.95	0.83	0.81	0.47	0.10	0.16*	0.22**	0.67**	**(0.69)**		
6.IC	3.21	0.95	0.89	0.63	0.17*	0.31**	0.36**	0.49**	0.49**	**(0.79)**	
7.CS	3.50	0.84	0.91	0.67	0.25**	0.21**	0.27**	0.52**	0.60**	0.52**	**(0.82)**

Notes. n = 187. Values in parentheses on the diagonal are the square of AVE of each scale.; **p<0,01; *p<0,05,

TL=Transformational Leadership, CL=Consideration Leadership, IC = Individual Creativity, CS= Career Satisfaction

DESCRIPTIVE STATISTICS

Table 2 displays the means, standard deviations, and correlations among the study variables. Results reported in Table 2 indicated that CS was positively correlated with TL (r=0.52, p<0.01), CL (r=0.60, p<0.01), and IC (r=0.52, p<0.01).

Furthermore, it was found that IC was positively associated with both TL (r=0.49,

p<0.01) and CL (r=0.49, p<0.01). Finally, results depicted in Table 2 revealed that gender (r=0.25, p<0.01), age (r=0.21, p<0.01), and tenure (r=0.27, p<0.01) was positively linked to CS.

HYPOTHESES TESTING

Following the validation of the measurement model, structural equation modeling (SEM) was used to evaluate the hypothesized relationships between the study variables. As shown in Table 3, SEM results, in which age, gender, and tenure were added to the model, provided an acceptable fit to the data (χ^2/ df = 487.074/233= 2.090, p <0.001, IFI = 0.93, TLI = 0.91, CFI = 0.93, RMSEA = 0.07, SRMR = 0.07). However, age (β = 0.01, p>0.05) and tenure (β = 0.02, p>0.05) were excluded from subsequent analyses, as they did not significantly affect CS (Model 1).

Table 3. Mediation Analysis of IC with Bootsrapping

	Total Effect	Direct Effect	Indirect Effect
Model 1			
Gender → CS	**0.14***	**0.14***	-
Age → CS	**0.01**	**0.01**	-
Tenure → CS	**0.02**	**0.02**	-
CL→ IC	**0.38****	**0.38****	-
TL→ IC	**0.25***	**0.25***	-
IC→ CS	**0.22****	**0.22****	-
CL→ IC → CS	**0.52****	**0.44****	**0.08** (LLCI = 0.01; ULCI= 0.21)**
TL→ IC → CS	**0.15**	**0.10**	**0.05 (LLCI = -0.01; ULCI= 0.21)**
Model 2			
Gender → CS	**0.14***	**0.14***	-
CL→ IC	**0.36****	**0.36****	-
TL→ IC	**0.26***	**0.26***	-
IC→ CS	**0.24****	**0.24****	-
CL→ IC → CS	**0.52****	**0.43****	**0.09**(LLCI = 0.02; ULCI= 0.19)**
TL→ IC → CS	**0.16**	**0.10**	**0.06* (LLCI = 0.01; ULCI= 0.16)**

Notes. n = 187; **p<0.01; *p<0.05; TL=Transformational Leadership, CL = Consideration Leadership, IC= Individual Creativity; CS = Career Satisfaction; Bias-corrected bootstrapping analysis was made with a bootstrapped 5,000 sample at 95% confidence interval. LLCI= Lower levels for confidence interval; ULCI =Upper levels for confidence interval.

SEM results for Model 2 showed a satisfactory fit to the data (χ^2/ df = 435.909/197=2.213, p <0.001, IFI = 0.93; TLI = 0.91, CFI = 0.93, RMSEA =0.08, SRMR = 0.06). H_{1a} proposes that TL is positively related to CS. The resultsindicated that TL did not have a significant and positive direct impact on CS (β =0.10, p>0.05), Thus, H_{1a} was not supported. H_{1b} predicts CL is positively related to CS. The results indicated that CL had a significant and positive direct impact on CS (β = 0.43, p<0.01). Therefore, H_{1b} was supported. Further, gender was found to have a significant and positive effect on CS (β = 0.14, p<0.01

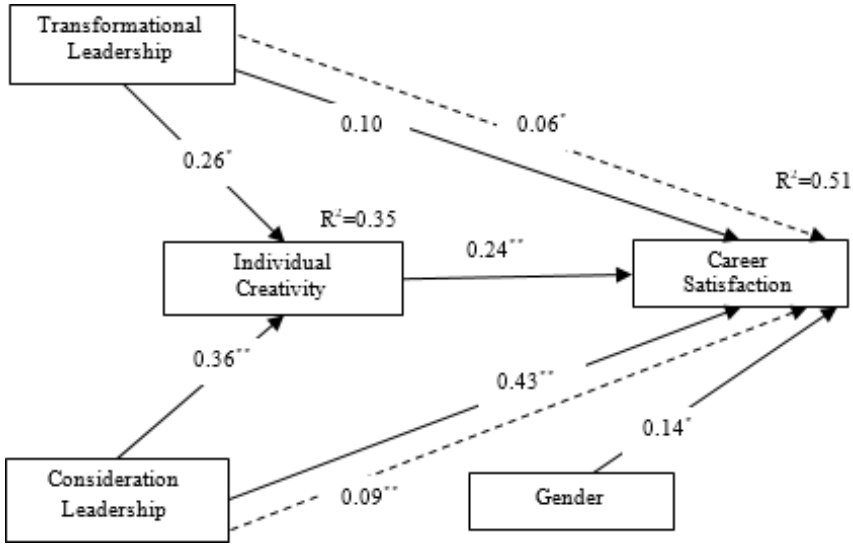

Figure 2. Direct (solid lines) and indirect effects (dashed lines) (**p<0.01; *p<0.05)

H_{2a} and H_{2b} was tested by using the bootstrapping procedure. To examine the significance of the indirect effects, 5,000 bootstrap samples were used to generate 95 percent bias-corrected confidence intervals (CI) around the indirect effects. Mallinckrodt *et al.* (38) pointed out that if the 95 percent bias-corrected CI do not contain a zero, the induced effect is considered significant. As depicted in Figure 2, the results showed that there were significant indirect effects from TL to CS (β = 0.06, 95%CI = [0.01, 0.16], p <0.05), and CL to CS (β = 0.09, 95%CI = [0.02, 0.19], p <0.01), providing support for H_{2a} and H_{2b}. Thus, TL and CL enhance IC, which in turn results in employee's CS. Specifically, one indirect-only mediation (TL → IC → CS) and one complementary mediation (CL → IC → CS) were found. (39) Overall, 51% of the variance in CS were explained both directly and indirectly by the TL and CL.

DISCUSSION

This study found that IC was significantly associated with CS. Further, this study indicated that the critical role of TL and CL in CS. More specifically, TL and CL were found to be significantly related with IC, which in turn positively impacts CS. Instead of the direct effect on CS, TL was one indirect-only mediated by IC. This study links TL, CL, IC, and CS in terms of theoretical contributions. Previously, little study had been conducted that merged the four research topics in career research. As a result, this study represents a crucial foundation for future career research. As the perception of TL and CL increases, the innovative behaviors of the employees in the workplace will increase, and thus, the employees will be able to obtain more satisfaction from their careers. As a result, organizations must embrace the connections and act rapidly to develop specific methods and tools for individuals and managers to improve TL, CL, and IC.

It can be deduced that CL can provide more satisfaction from employees' careers by increasing the development of employees (40), motivating them for creativity, and increasing their individual creativity. Moreover, transformational leaders will also be able to increase employees' IC by creating an innovative work environment and encouraging their followers to learn and innovate, paving the way for them. (15) In this way, employees who think that they are encouraged for their creativity will be more satisfied with their careers.

Not only for workplace innovation but also in the sense of personal professionalism, leaders tend to have a significant impact on employees as well. Employees seek to have more of individual time and creativity for their own working skills, and that can be only done through a right management in the organization. According to the study, the main outcomes are about the individual decision-ma- king process in a job environment and leader's attitudes that frames the working environment in the shape of the job definition. Leaders tend to work with the specified employees that carry the common features of the organization, and they are not opened to work with differentiated employees that have different aspects from their frames. Human resources departments should build their action plans accordingly to the managerial approaches and taking consideration of individual creativity capacity of the employees.

There are some limitations to the current study that should be acknowledged. First, the data were cross-sectional. This implies we can't be sure which way the relationships we've uncovered will go. To further understand the causal relationships between TL, CL, IC, and CS, more research utilizing a longitudinal approach is needed. Second, our research was limited to employees of technology development zones. As a result, the study's sample does not reflect the whole population. Future study should be conducted with a larger population and in a wide range of businesses.

REFERENCES

1. Brabandt, N. (2016), "Finding a solution to leadership: the development of an effective and sustainable leader-ship concept based on the considerations of the pioneers of management and leadership", PhD thesis, New York University.
2. Totterdill, P. (2015), "Closing the gap: The fifth element and workplace innovation", *European Journal of Workplace Innovation*, Vol. 1 No. 1, pp.55-74.
3. Black, S.E. and Lynch, L.M. (2004), "What's driving the new economy?: The benefits of workplace innovation", *The Economic Journal*, Vol. 114 No. 493, pp.F97-F116.
4. Johnsen H.C.G. (2015), "EJWI", *European Journal of Workplace Innovation*, Vol. 1, No. 1., pp.13-15.
5. Houghton, J.D. and DiLiello, T.C. (2010), "Leadership development: The key to unlocking individual creativity in organizations", *Leadership & Organization Development Journal*, Vol. 31 No. 3, pp.230-245.
6. Wipulanusat, W., Panuwatwanich, K. and Stewart, R.A. (2018), "Pathways to workplace innovation and career satisfaction in the public service: the role of leadership and culture", *International Journal of Organizational Analysis*, Vol. 26 No. 5, pp.890-914.
7. Shibru, B. and Darshan, G.M. (2011), "Effects of transformational leadership on subordinate job satisfaction in leather companies in Ethiopia", *International Journal of Business Management & Economic Research*, Vol. 3 No. 5, pp. 284-296.
8. Nemanich, L.A. and Keller, R.T. (2007), "Transformational leadership in an acquisition: A field study of employees", *The leadership quarterly*, Vol. 18 No. 1, pp.49-68.
9. Johnson, R.E., Venus, M., Lanaj, K., Mao, C. and Chang, C.H. (2012), "Leader identity as an antecedent of the frequency and consistency of transformational, consideration, and abusive leadership behaviors", *Journal of Applied Psychology*, Vol. 97 No. 6, pp.1262-1272.
10. Gumusluoglu, L. and Ilsev, A. (2009), "Transformational leadership, creativity, and organizational innovation", *Journal of business resear- ch*, Vol. 62 No. 4, pp.461-473.
11. Williamson, J.M., Lounsbury, J.W. and Han, L.D. (2013), "Key personality traits of engineers for innovation and technology development", *Journal of Engineering and Technology Management*, Vol. 30 No. 2, pp.157-168.

12. Perry, S.J., Hunter, E.M. and Currall, S.C. (2016), "Managing the innovators: Organizational and professional commitment among scientists and engineers", *Research Policy*, Vol. 45 No. 6, pp.1247-1262.
13. Bass, B.M., and Avolio, B. J. (1994). Improving organizational effectiveness through transformational leadership. Thousand Oaks, CA: Sage.
14. Bass B.M. (1999), Two decades of research and development in transformational leadership. *European Journal of Work and Organizational Psychology*, Vol. 8 No. 1, pp.9-32.
15. Jaiswal, N. K. and Dhar, R. L. (2015). Transformational leadership, innovation climate, creative self-efficacy and employee creativity: A multilevel study. *International Journal of Hospitality Management*, *51*, 30-41.
16. Garcia-Morales, V. J., Jiménez-Barrionuevo, M. M. and Gutiérrez-Gutiérrez, L. (2012). Transformational leadership influence on organizational performance through organizational learning and innovation. *Journal of business research*, *65*(7), 1040-1050.
17. Yukl, G.A. (2006), Leadership in Organizations, Prentice-Hall, Upper Saddle River, NJ.
18. Mulla-Feroze, A.H. and Krishnan, V.R. (2000), "Consideration, initiating structure, and transformational leadership: the role of gender", Paper Presented at the 37th Annual Meeting of the Eastern Academy of Management, Danvers, MA.
19. Greenhaus, J.H., Parasuraman, S. and Wormley, W.M. (1990), "Effects of race on organizational experiences, job performance evaluations, and career outcomes", *Academy of management Journal*, Vol. 33 No. 1, pp.64-86.
20. Joo, B.(B). and Park, S. (2010), «Career satisfaction, organizational commitment, and turnover intention: The effects of goal orientation, organizational learning culture and developmental feedback", *Leadership & Organization Development Journal*, Vol. 31 No. 6, pp. 482-500.
21. Joo, B. K., and Lim, T. (2013). Transformational leadership and career satisfaction: The mediating role of psychological empowerment. *Journal of Leadership & Organizational Studies*, Vol. 20 No. 3, pp.316-326.
22. Li, J. and Yuan, B. (2017). Both angel and devil: The suppressing effect of transformational leadership on proactive employee's career satisfaction. *International Journal of Hospitality Management*, Vol. 65, pp.59-70.

23. Amabile, T. M. and Pillemer, J. (2012). Perspectives on the social psychology of creativity. *The Journal of Creative Behavior*, *46*(1), 3-15.
24. Egan, T.M. (2005), "Factors influencing individual creativity in the workplace: An examination of quantitative empirical research", *Advances in developing human resources*, Vol. 7 No. 2, pp.160-181.
25. Taggar, S. (2002), "Individual creativity and group ability to utilize individual creative resources: A multilevel model", *Academy of management Journal*, Vol. 45 No. 2, pp.315-330.
26. Keller, R.T. (2006), "Transformational leadership, initiating structure, and substitutes for leadership: a longitudinal study of research and development project team performance", *Journal of applied psychology*, Vol. 91 No. 1, pp.202-210.
27. Gürlek, M. (2020), *Tech Development through HRM: Driving Innovation with Knowledge-Based Cultures*. Emerald Group Publishing, Bingley, UK.
28. Republic of Turkey Ministry of Industry and Technology (2021), Statistical Information ofTechnology Development Zones in Turkey, Ankara, viewed 6 March 2021, <https://www.sanayi.gov.tr/ istatistikler/istatistikibilgiler/mi0203011501>
29. Podsakoff, P.M., MacKenzie, S.B., Lee, J.Y. and Podsakoff, N. P. (2003), "Common method biases in behavioral research: a critical review of the literature and recommended remedies", *Journal of applied psychology*, Vol. 88 No. 5, pp.879-903.
30. Brislin, R.W. (1980). Translation and content analysis of oral and written material, in Triandis, H.C. and Berry, J.W. (Eds), Handbook of Crosscultural Psychology: Methodology, Vol. 2, Allyn and Bacon, Boston, MA, pp. 389-444.
31. Aryee, S., Chay, Y.W. and Tan, H.H. (1994), "An examination of the antecedents of subjective career success among a managerial sample in Singapore", *Human Relations*, Vol. 47 No. 5, pp. 487-509.
32. Nabi, G.R. (2001), "The relationship between HRM, social support and subjective career success among men and women", *International Journal of Manpower*, Vol. 22 No. 5, pp. 457-474.
33. Ng, T.W.H., Eby, L.T., Sorensen, K.L. and Feldman, D.C. (2005), "Predictors of objective and subjective career success: a meta-analysis", *Personnel Psychology*, Vol. 58 No. 2, pp. 367-408.
34. Wayne, S.J., Liden, R.C., Kraimer, M.L. and Graf, I.K. (1999), "The role of human capital, motivation and supervisor sponsorship in predicting

career success", *Journal of Organizational Behavior*, Vol. 20 No. 5, pp. 577-595.

35. Hu, L.T. and Bentler, P.M. (1999), "Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives", *Structural Equation Modeling: A Multidisciplinary Journal*, Vol. 6 No. 1, pp. 1-55.
36. Fornell, C. and Larcker, D. F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of marketing research*, Vol. 18 No. 1, pp.39-50.
37. Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. and Tatham, R.L. (2006), Multivariate Data Analysis, 6th ed., Pearson Prentice Hall, Upper Saddle River, New Jersey.
38. Mallinckrodt, B., Abraham, W.T., Wei, M. and Russell, D.W. (2006), "Advances in testing the statistical significance of mediation effe- cts", *Journal of counseling psychology*, Vol. *53 No.* 3, pp.72-378.
39. Zhao, X., Lynch Jr, J. G., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of consumer research*, *37*(2), 197-206.
40. Ogola, M.G.O., Sikalieh, D. and Linge, T.K. (2017), "The Influence of Individualized Consideration Leadership Behaviour on Employee Performance in Small and Medium Enterprises in Kenya", *International Journal of Business and Social Science*, Vol. 8 No. 2, pp.163-173.

Hydrogen Production and Storage Processes

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INTRODUCTION

The lifeblood of today's culture and the economy is energy. Work, recreation, and our economic, social, and physical well-being all depend on a constant supply of resources. Nonetheless, we take it for granted, and annual energy demand continues to rise. Traditional fossil fuels, such as oil, are finite, and the rising demand for them is outpacing supply would require alternative primary energy sources to fill the void in the not-too-distant future [2]. Perhaps the most urgent threat that our planet faces is anthropogenically induced climate change and its inextricable connection to our global society's existing and potential energy needs. To avoid the negative effects of global climate change, the rising risk of supply shortages, market instability, and air pollution associated with today's energy systems, we must work to make them more sustainable. The European Commission's energy policy supports ensuring energy supply while also reducing greenhouse gas emissions linked to climate change. This necessitates immediate action to encourage carbon-free energy sources such as renewable energy, alternative transportation fuels, and increased energy efficiency.

Over the last 10-15 years, codes and standards for hydrogen storage and transport have progressed significantly, and they currently cover the majority of hydrogen applications under consideration. Hydrogen is presently carried by trucks and pipes and kept in tanks approved by ASME for stationary usage or the US Transportation department (DOT) for transportation/delivery purposes. The challenges to expanding the usage of hydrogen for constant power generation include increased training and education of some codes and regulatory authorities on the operations for hydrogen production system permitting, ongoing attempts to reduce the cost of electrolysers in order to enable renewable hydrogen generation, enhanced steam methane reformer efficiency and performance. Hydrogen is currently wide thought to be one key component of a potential energy solution for the 21st century, capable of addressing issues such as environmental pollution, property, and energy security. Hydrogen can provide energy in power generation,

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transportation, energy storage systems, and distributed heat, with very little or no effects on the environment both globally and domestically. However, any shift from a CO_2-based (fossil fuel) economy to a H_2-based one confronts enormous scientific, technical, and socioeconomic challenges. Hydrogen is currently used extensively in oil refining (hydro-treating petroleum as part of the distillation of crude oil), production of food (e.g., hydrogenation), metal treatment, and some further industrial uses.

THE METHODS OF HYDROGEN PRODUCTION

Hydrogen may be produced using renewable energy, oils or coal, biofuels, or water as a source in thermal, electrolytic, or photolytic processes. Three thermal approaches are utilized to produce hydrogen from methane partial oxidation (POX), steam methane reforming (SMR) and auto thermal reforming (ATR), which combines the SMR and POX processes. The gasification process is typically employed when coal or heavy oils are utilized.

THE PURPOSE OF HYDROGEN PRODUCTION

The potential effects of global climate change terribly serious and most significant of all, irreversible. Thus, we have a tendency should aim for the perfect emissions-free future supported property energy. Electricity and chemical element along represent one in all the foremost promising ways that to attain this, complemented by fuel cells which offer terribly economical energy conversion. Hydrogen can be employed to get power in fuel cells by a reaction rather than combustion, with only water and heat as byproducts. It can be used in automotive, buildings, electricity, and some other applications [1].

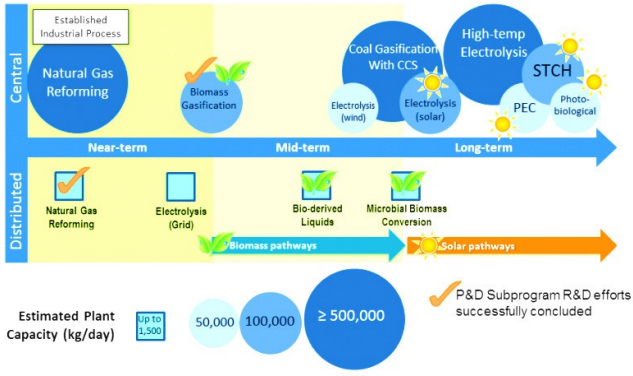


Figure 1: Hydrogen production pathways.

The Working Principles of Hydrogen Production

Hydrogen is widely used in industry, including, steel production, ammonia, oil refining, iron, and methanol synthesis, and its production has quadrupled since 1975, reaching 115 Mton/y. Hydrogen may be produced using a variety of local resources, like fossil fuels like natural gas and coal (with carbon), nuclear power, other sources of renewables including hydroelectric power, sunlight, wind, geothermal, and biomass, through a variety of processes. Approximately 95% of hydrogen is now generated from fossil energy, resulting in yearly CO2 emissions of approximately 830 Mtons. Because of the high cost of production, Natural gas steam reforming (SR), accounts for 48 percent of existing hydrogen supply, 30 percent through the petroleum fraction, Coal gasification accounts for 18 percent of the total, and electrolysis accounts for just 4 percent. In the long term, renewable energy sources will become the most significant source of hydrogen production, which are a nearly carbon-free energy pathway [1][5].

Natural Gas and Other Fossil Fuels

The majority of hydrogen generated is derived from fossil energy, which may be reformed to liberate hydrogen from their hydrocarbon chains. The emissions of carbon dioxide can be reduced by integrating these methods with carbon capture and storage. Natural gas reforming is a sophisticated and well-established hydrogen production method that takes advantage of existing natural gas infrastructure. This is an important pathway for producing hydrogen soon [1].

Methods for producing hydrogen using fossil fuels:

- Natural gas reforming processes
- Coal gasification processes
- Carbon capture, storage and utilization.

Natural gas reforming can be accomplished through a variety of technical pathways, which are broadly classified as biochemical, thermochemical, and photochemical. Since natural gas contains (CH_4), It may be used to produce hydrogen through thermal methods in which natural gas methane is heated with steam. Steam Methane Reforming is the name given to this process (SMR). This is accomplished using a reformer, which is a type of processing unit [6].

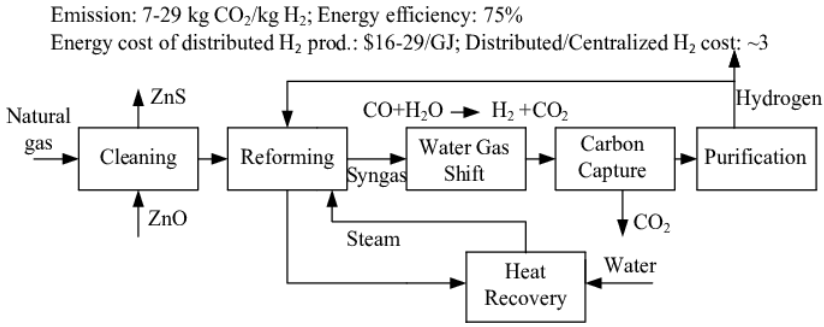


Figure 2: Natural gas steam reforming produces hydrogen. [5].

Steam gas reforming is that the most generally known technique to generation of hydrogen and it contributes concerning 50% of the world's production. This can be for the most part because of its cost-effectiveness in getting a high level of purity in its created element. The hydrogen produced from SMR method is often employed in industrial applications and in fuel cells as a result of its purity. It is a proven production technology that uses elevated steam (700°C–1000°C) is employed to supply a mix of CO gas and H_2 from a gas supply, the CH_4 gas interacts with steam at 3–25 bar in the presence of catalysts to generate H_2 and CO gas, and a modicum of carbon dioxide [6][7]. Steam reforming is temperature dependent, which means that heat must be supplied to the process for the reaction to occur. In order to get a very pure element stream, many steps are necessary, like reducing the carbon monoxide gas content within the reforming stream by fuel displacement reactors, pressure swing absorbers, and additional element separators purifiers. Methane reacts with steam by the following reactions: [1]

$CH_4 + H_2O + \text{Heat} \rightarrow CO + 3H_2 \Rightarrow$*Steam-Methane Reforming Reaction.*

After that in a "water-gas shift reaction," The CO and steamed are then reacted with a catalysis in a "water-gas shift reaction" to produce CO_2 and additional H_2.

$CO + H_2O \rightarrow CO_2 + H_2 +$*small amount of heat* $\Rightarrow$ *Water-gas entegre reaction.*

"Scholz (1993) estimates that CO2 emissions from the SMR process equal to 0.44 Nm^3 CO_2/Nm^3 H_2 (or 9.7 kg CO_2/kg H_2)".

Greenhouse gas was previously isolated from raw H_2 (following a CO shift reaction) bye chemical absorption processes, resulting in the release of a pure CO_2 stream into the atmosphere. Physical adsorption technology is used in modern SMR plants, specifically pressure swing adsorption (PSA) units. PSA is a final process stage that removes greenhouse gas and other contaminants from the gas stream, leaving essentially pure hydrogen [6][7].

Table 1: Typical CO2 partial pressures and flow rates in SMR plant for several streams [6].

SMR Streams	CO_2 Flow Rate (kmol/h)	CO_2 Partial Pressure (bar)
Shifted gas	1000	3,40
PSA tail gas	1000	0,60
Flue gas	1850	0,20

Approximately 60 percent of the total CO_2 generated in a typical contemporary SMR plant is contained in the altered gas, with the remaining 40% is the product of NG fuel combustion, which provides heating rate to the steam reformer. Regardless of that the PSA device produces high-purity hydrogen gas (nearly 100 percent), it does not distinguish CO_2 from other exhaust fumes as CO or CH_4.

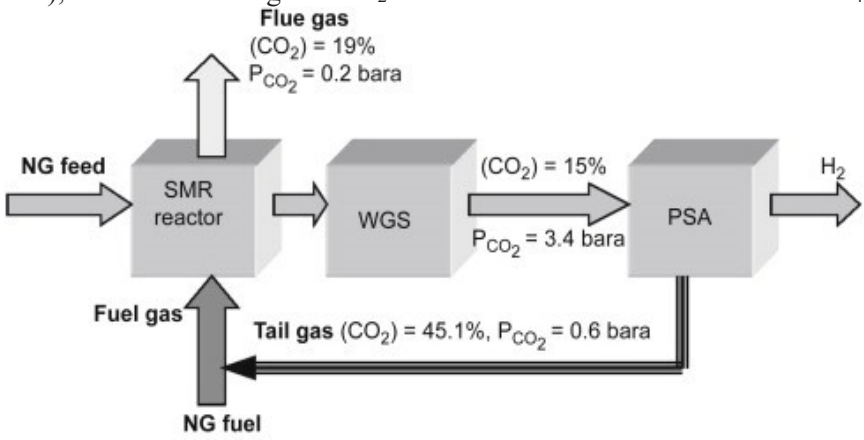
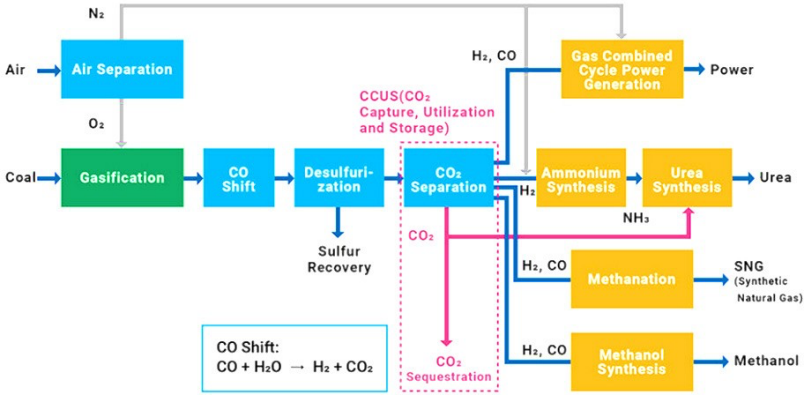


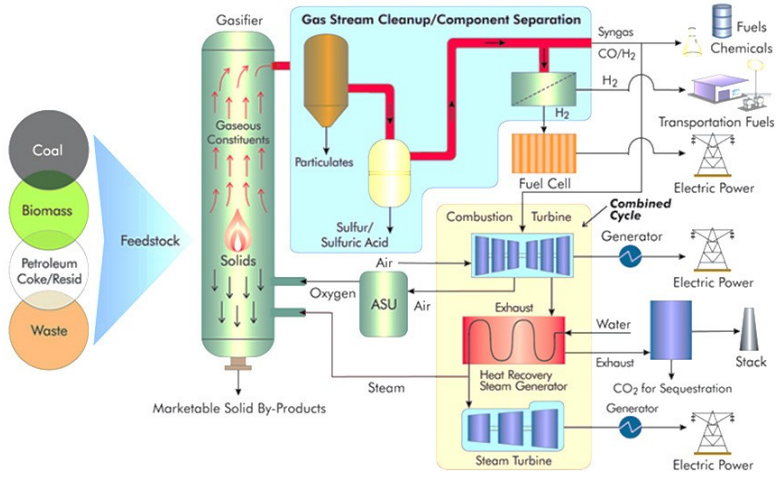
Figure 3: A schematic illustration of a typical SMR plant. [6].

Since coal is inexpensive, it continues to be the world's primary source of energy, supplying a fifth of our primary energy and more than 40% of our electricity. Since carbon based fuels emits high gas (CO_2) and sulfur into the atmosphere during use, the challenge is to harness coal's energy more cleanly. According to the European Union's Green Policy, CO_2 is primarily regarded as a waste product, and it should be collected and then chemically sequestered or deposited underground to achieve global CO_2 reduction targets. A quick expansion in the number of CCS experiments and industrial plants has been identified as a vital necessity for the implementation of green policies. CCS technologies, on the other hand, have not been widely adopted. There are currently only 19 operational installations in the world. CCS is predicted to attain a storage capacity of 750 Mm CO_2 per year by 2030, according to the International Energy Agency (IEA) (cur-

rently only 5 percent of that amount has been achieved [9]. Currently, some of the CCS plants in operation are devoted to hydrogen generation, Gasification of coal for hydrogen generation is one of the world's most innovative and well-established technologies. They appear to be the most cost-effective method of hydrogen production. Gasification of coal is a technical method that converts any carbon - containing raw material, such as coal, into fuel gas, generally called as synthesis gas (syngas for short), which can be used to generate electricity, liquid fuels, chemicals, and hydrogen. In most cases, 1 kg of bituminous coal will yield 1.5–1.7 m^3 of syngas. To produce hydrogen, Coal is first reacted with Oxygen gas and water vapour at high temperatures and pressures to create producer gas. Gasification takes place in a reactor, which is typically a high temperature/pressure vessel where oxygen, air, or steam are directly contacted with coal or other feed materials, creating a series of chemical reactions that transform the feed to producer gas and ash/slag (mineral residues) [8]. The design of the ash-removal method is generally dictated by the operating temperature of a gasifier. Dry ash removal is possible at temperatures below 1000°C (1800°F), while temperatures between 1000° C and 1200°C (1800° and 2200°F) cause the ash to partially melt and form agglomerates. At temperatures above 1,200°C, the ash melts and is removed mainly in the form of liquid slag. The composition of the final product gases is affected by both temperature and pressure. Gasifiers may work at ambient or elevated pressure [10]. The syngas can be further reduced to hydrogen and carbon dioxide by using steam and reacting over a catalyst in a water-to-gas reactor (CO_2). After the contaminants in the producer gas are removed, the carbon monoxide in the gas mixture is reacted with steam to produce further H_2 and CO_2 via the water-gas reaction. A filtration system eliminates H_2 from the stream, enabling the supersaturated CO_2 to be collected and stored. [8]



(a)



(b)

Figure 5: The coal gasification technology, and also a variety of products (a) gasification applications (b).

As hydrogen is consumed, it produces only water and heat, allowing generating energy without the use of CO_2 in the exhaust gases. There are a few hurdles to using coal gasification to create hydrogen at goal costs and with relatively close greenhouse emissions. More R&D are required in order to:

- Enhance carbon capture, utilization, and storage technologies technology to ensure that the production process generates the least amount of CO_2.
- Create innovative technology to replace the present cryogenic process for extracting oxygen from air.

Carbon Capture, Utilization, and Storage (CCUS) is an effective emissions mitigation technology that can be implemented through the energy sector to prevent CO_2 from entering the atmosphere. It comprises methods and technology for extracting CO_2 from flue gases and the atmosphere, recycling CO_2 for reuse, and assessing safe and reliable storage choices. CCUS technologies must be introduced regardless of the implementation of renewable and sustainable energy solutions to reduce the total amount of CO_2 in the atmosphere and limit the negative effects of climate change [11].

Hydrogen produced by coal gasification produces almost double as much carbon as hydrogen derived from natural gas. Using CCS technology, ambient CO_2 emissions from either feedstock are reduced by around 85%. Using carbon capture and storage, hydrogen may be created directly from coal with relatively close greenhouse gas emissions. Because growing biomass absorbs carbon dioxide from the environment, producing hydrogen from biomass gasification resulted in near-zero net greenhouse emissions without CCS [12][13].

Solar Methods

In 1975, a team of Japanese researchers recently published a description of a working prototype for simulating photosynthesis to generate hydrogen using solar energy. A photovoltaic wafer with two electrodes separated by a membrane is immersed in an electrolyte solution, in this case, water, in this procedure. Each electrode is made of photosensitive semiconductor material that has been coated with a catalyst that aids in the production of O_2 at the anode and H_2 at the cathode. The Hydrogen can be retrieved after the water has been split [14-16]. At room temperature, Hydrogen can be created by splitting water into H_2 and O_2 using sunlight. This form of artificial photosynthesis had been dubbed the “Holy Grail of science” just sixteen years before.

The processes using solar energy for Hydrogen production:

1. Solar thermochemical hydrogen (STCH)
2. Photoelectrochemical (PEC)
3. Electrolysis
4. Photobiological.

Solar thermochemical hydrogen (STCH): High-temperature heat (500° C–2000° C) from solar energy or waste heat from nuclear energy operations and chemical reactions are used in these water splitting procedures to drive a series of chemical reactions that generate O_2 and H_2 from water [17]. This can be hundreds of thermochemical cycles that could be used, but only a handful have been shown to be commercially viable. A series of reactions that breakwater at lower tempe-

ratures (500°C –1000°C) than thermal dissociation (>2500°C), with other species recycled in the system, are commonalities among thermochemical cycles. Direct thermochemical cycles (all chemical steps) and hybrid thermochemical cycles (a mixture of chemical and electrochemical steps) are two types of thermochemical cycles. All thermochemical cycles may be classified as solar thermochemical hydrogen processes if concentrated solar energy is used for the thermal dissociation phase [15].

Each cycle recycles the chemicals used in the process, creating a closed-loop system that produces hydrogen and oxygen using only water.

The following methods can be used to produce the necessary high temperatures:

1. To direct solar energy into a reactor tower, a cluster of mirror "heliostats" is used [17].
2. Using advanced nuclear reactor waste heat as a source of energy

The two sources listed above produce the high temperatures needed for STCH to produce hydrogen with low greenhouse gas emissions.

Photoelectrochemical (PEC): It's a process electrolysis of water to hydrogen and oxygen by using sunlight and specialized semiconductors called photoelectrochemical materials [18]. An electrolyte-immersed cathode and anode and linked in an external circuit make up a Photo-electrochemical Cell (PEC). The cathode or anode is usually made of a semiconductor that absorbs sunlight, while the other electrode is usually made of metal. When solar energy conversion and water electrolysis are combined in a single photocell, hydrogen is generated. This method of hydrogen production is low-cost, sustainable, and environmentally friendly [18][19].

Photobiological: This hydrogen production technology, using solar energy and microorganisms to divide water into ions of oxygen and hydrogen, and sometimes organic matter. Cyanobacteria or green microalgae can divide water into oxygen and hydrogen when illuminated, and their carbon source by consuming the CO_2 gas. So, it's zero CO_2 emission [26][27].

Hydrogen Storage: Since hydrogen is one of the lightest elements and has a very small molecular weight, it is thought to be much simpler to spill from tanks and pipes than traditional fuels, and if this hydrogen is used as a fuel for transportation or to produce electricity, the efficient and low-cost methods of storing it are needed. We consider hydrogen storage as a definition of the various ways in which hydrogen gas can be retained for future use. These procedures rely on a variety of techniques, such as the use of high pressure, extreme cooling, or chemical compounds. Hydrogen storage is one of the hydrogen economy's current goals.

The majority of hydrogen storage research is focused on storing hydrogen as a lightweight energy carrier for a variety of applications. We can divide the hydrogen storage methods as follows [38-40].

The method of storing hydrogen in the form of gas is one of the most simple and common technologies, as this process takes place inside tanks or containers and gas cylinders. To resist pressures, lightweight composite tanks have been designed of about (850 bar), and the maximum pressure has been achieved to filling the Containers about (1094 bar), as there are other methods of storing hydrogen as a gas, such as refrigerated gas, as the gaseous hydrogen is cooled at cooler temperatures, which enhance the energy density of the gas. The method of storing it in the form of gas was as follows.

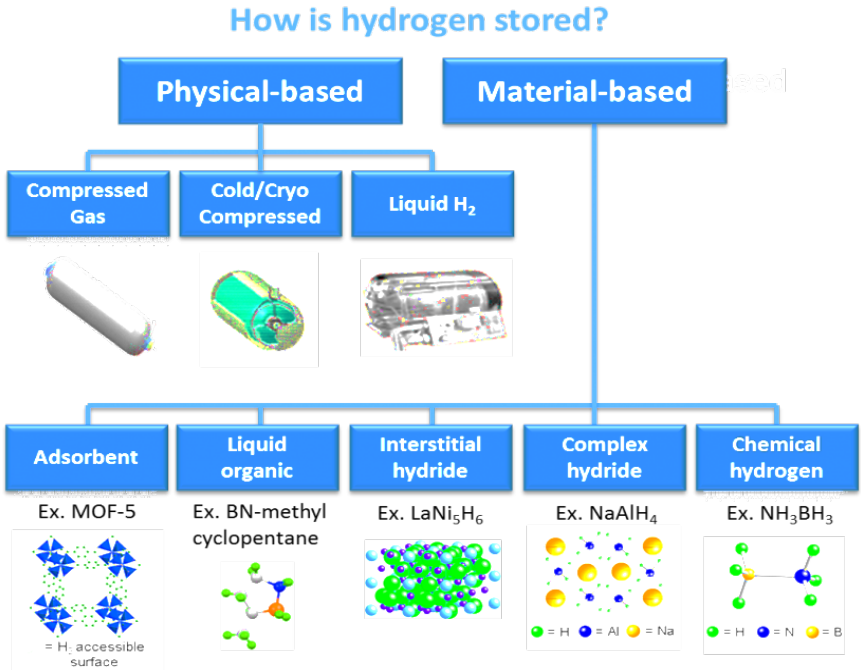


Figure 6: The prosses of Hydrogen Storage

Hydrogen Compression: The hydrogen compression process is equivalent to the process of compressing a gas, and hydrogen is usually compressed at a pressure of about (25-200 bar) if it is stored in cylindrical tanks with small capacities up to (50 liters). For large scales, it is compressed under high pressures and stored in more ticked walled tanks, most of which are cylindrical and carbon or aluminum composite tanks are one of the most mature technologies. So, these tanks are can withstand high pressures of about (700 bar) where the gas density

is at a pressure of (350 bar) about (20 kg/m^3) and a density of (35-40) kg/m^3 at a pressure of (700 bar) where there is needed to pressure about (2000 bar) to reach the density (70 kg/m^3). To achieve such high pressures is not considered realistic, it is clear that storing hydrogen at high pressure has some disadvantages. It will never reach a high density in addition to its storage capacity in the vessel is limited. Because the increase in pressure is not proportional to an increase in the storage capacity at high pressure with a large loss of energy during the pressure of hydrogen. For storage currently used in the world, and in order to move to a hydrogen-based economy and hydrogen use, other forms of storage must be developed [39][41-42].

Storage of hydrogen in liquid form*:* After compressed gas, this is the second most used storage technique is hydrogen storage as a liquid where H2 can be stored in the form of a cryogenic liquid at a temperature below zero (-253°C), or it can be kept as a component in other liquids that are used, such as NaBH4 solution and reusable organic fluids. Or, anhydrous ammonia, and liquid hydrogen in some commercial compounds, as they contain liquid hydrogen at a density of 70.8 kg/m^3 and at a pressure of 13 bar, and upon reaching a temperature (-240°C), it begins to change its phase from gas to liquid, and it is called the critical point. It has a gravitational density close to 100% like gaseous hydrogen. However, the total density of hydrogen cannot be exploited, as its utilization rate is estimated at 20% of its weight, and it has a large energy density per unit volume ranging from 30 kg/m^3 to 80 kg/m^3 in addition to that energy of (30-40) % when producing liquid hydrogen. Hydrogen is stored in special production containers with refrigeration, often referred to as refrigerants, where these containers are dual walled with an insulator between the walls, as this insulator is important and that is to reduce the heat flow. Liquid nitrogen is also employed as an inactive to further minimize energy transfer, and it is characterized by this liquid hydrogen has a high storage density at relatively low pressures. In addition, its stored energy is much better than compressed hydrogen.

Storage of hydrogen in solid form: Chemists are currently looking at a different way to store hydrogen for fuel cell vehicles. Their research was mainly based on the composition of a substance containing a large amount of hydrogen, which is one of the most potential future storage methods, although it is still in the stage of research and development. In principle, there are two methods of storing hydrogen in a solid substance, which differ in the way hydrogen is bound to the solid, so the state of storage was according to two mechanisms: Chemisorption–Physisorption.

Chemisorption*:* This method depends on the creation of a chemical link

between the solid and the hydrogen atom, and this technique includes breaking the H-H bond and resulting in a new H so that it forms a strong bond with the solid substance by carrying out chemical processes that result in hydrogen absorption, as in hydrates [44-47].

Substances in which hydrogen is chemically has a higher density compared to substances in which hydrogen is absorbed, chemical removal entails the decomposition of molecular hydrogen so that the hydrogen is deposited as hydrogen atoms. Transition metals may be applied to the substance to allow this dissociation; the electrons of the transition metal dissociate the H-H connection [46-47].

Hydrides*:* Hydrogen can form compounds with other elements when interacting with metals such as Sodium Hydride (NaH) and Calcium Hydride (CaH_2), in which hydrogen takes a negative oxidation number, that it reacts by gaining one electron with the elements that have the least electronegativity [48].

Physisorption*:* Physical attraction alone is used to adsorb hydrogen molecules on the surface of a solid, as new bonds are not formed due to the presence of Van der Waals For forces that lead to hydrogen absorption such as porous carbon materials, as they have weak bonds and the energy required is relatively low to release stored hydrogen. Substances that absorb hydrogen depend on their surface area to store hydrogen and tend to have low volumetric capabilities. However, it is generally based on carbon, so its storage forms are as follows :It has drawn attention to storing hydrogen in small carbonates, including active carbon, carbon nanotubes, nanofibers, and, more recently, microporous carbonates and it is the technology that focused on, due to its low molar mass and chemical stability, and in practice, porous carbonates are marketed in quantities Large and it is relatively inexpensive [49-51]. Another alternative in carbon nanostructure is carbon nanotechnology, which is the implantation of carbon nanofibers by decomposing hydrocarbons or CO on a metal catalyst. These fibers consist of graphite sheets aligned in a specific direction, as graphite nano fibers are ideal for gas absorption, and their ability for hydrogen absorption is estimated at about 10% per unit mass, and it has been shown that carbon fullerene C_{60} and C_{70} store hydrogen in a reverse manner [50][51].

Carbon Nanotubes*:* The decomposition of gas molecules on the solid's surface is dependent on van der Waals forces, and since the reaction is weak, high physical absorption is observed at low temperatures, and extensive research has been conducted, especially in carbon nanotubes, as carbon nanotubes are cylindrical shaped structures with open ends or closed ends. The closed band contains a hemispherical end at each end, where it types are (multi-walled nano tubes and single-walled nanotubes).

The single-walled tubes made up of a single graphene sheet and are wrapped in the form of a cylinder and have a diameter of a few nanometers (nm). As for the multi-walled carbon tubes, they are several coaxial coils of graphene sheets, as between each layer and another layer about (0.35 nm), and these tubes need a catalyst, such as CO and Ni.

***Organic and Non-Organic Nanoparticles**:* Carbon nanotubes have had a lot of publicity as possible storage material, and there are many other nanomaterials, including organic and inorganic, they are also Scientists Rao and Nath provided a summary of inorganic nanotubes and their constituents. Many of these factors, particularly those made up of light components, have been looked at about the properties of hydrogen storage. Also, other materials have been studied theoretically or experimentally for hydrogen storage properties, including titanium oxide (TiO_2), tungsten carbon (WC), silicon (C), and silicon sulfur, (SC), for example, the capacity of some nanotubes multi-walled to another species has the potential to store large quantities of hydrogen [52].

Despite the different hydrogen storage methods, it is still difficult to choose the most appropriate method, because storage in the solid-state is still under research and development, unlike the gaseous and liquid states.

CONCLUSIONS AND RECOMMENDATIONS

Increased training and education of some codes and regulatory authorities on the operations for hydrogen system permitting, are among the hurdles to growing the use of hydrogen for stationary power production, ongoing attempts to reduce the cost of electrolysis to enable renewable hydrogen generation, enhanced steam methane reformer efficiency and performance. ‘Blue’ fossil-based hydrogen is not zero-emissions potential and threatens securing high-carbon facilities and employment. Currently, the gasification, steam reforming, and partial oxidation methods that use fossil fuels produce the most hydrogen fuel. These technologies face a variety of problems, including carbon emissions to the atmosphere and high overall energy consumption. In addition to the more traditional technologies of SMR, gasification, and grid-powered electrolysis, a fresh batch of renewable production alternatives is appearing. These include direct electrolysis utilizing renewable energy, multiple biogas conversion alternatives, and newly designed photo-electrochemical and thermochemical processes.

In conclusion, hydrogen is an extremely viable energy carrier and fuel for stationary and mobility applications, but its potential wider usage is fraught with technological and infrastructural hurdles. Hydrogen is a critical and valuable resource for the future, and it should be utilized where it contributes the most value

to the environment, jobs, and economic recovery. Zero-emissions, “green” hydrogen derived from renewable energy is expected to remain a premium commodity in the future decades.

Green hydrogen, when used intelligently, may enable the decarbonization of industrial centers, assisting in addressing some of the most pressing climate concerns in industries where there are currently no easily available paths to zero emissions. Furthermore, during the last years, codes and standards for hydrogen transport and storage have advanced significantly and currently cover most of the hydrogen uses under consideration. Hydrogen is currently delivered in a variety of ways, including vehicles and pipelines, and is kept in tanks that have been approved by ASME for stationary usage. However, further codes and standards must be developed.

REFERENCES

1. Hydrogen, Fuel Cells, and Infrastructure Technologies Program, Approved by Steven Chalk, U.S Department Energy of efficiency and Renewable Energy Office of Hydrogen, Fuel Cells, and Infrastructure Techno logies, November 2002.
2. Hydrogen Production ans Storage, R&D Priorities and Gaps, Trygve Riis, and Elisabet F. Hagen, Preben J. S. Vie and Qystein Ulleberg (Corresponding authors), International Energy Agency, 2006.
3. Between Hope and Hype: A Hydrohen Vision for The UK: J. Phillips, L.Fischer
4. An overview of hydrogen production and storage system with renewable Hydrogen Case studies, by Timothy Lipman, PhD
5. Hydrogen Production via Steam Reforming: A Critical Analysis of MR and RMM Technologies, Giovanni Franchi, Mauro Capocelli, Marcello De Falco, Vincenzo Piemonte and Diego Barba
6. Low-carbon production of hydrogen from fossil fuels, N. Muradov, in Compendium of Hydrogen Energy, 2015.
7. Compendium of Hydrogen Energy: Hydrogen Production and Purification ‹ Angelo Basile‹ T., Velu Subramani, Nejat Veziroglu
8. Gasification Processes Old and New: A Basic Review of the Major Technologies, Ronald W. Breault, February 2010
9. Economic Conditions for Developing Hydrogen Production Based on Coal Gasification with Carbon Capture and Storage in Poland by Radosław Kaplan and Michał Kopacz.
10. Coal Gasification, David Rand, March 2018.
11. Carbon Capture, Utilization, and Storage: An Optimization Model, Mahnaz Asghari, Hamed Shakouri G, June 2014
12. Carbon Capture, Utilisation and Storage, (CCUS): Decarbonisation Pathways for Singapore's Energy and Chemicals Sectors, By: Preeti Srivastav, Mark Schenkel, Goher Ur Rehman Mir, Tom Berg, Maarten Staats
13. Carbon capture and storage (CCS), Mai Bui, Claire S. Adjiman, Andre´ Bardow, 5th January 2018, Energy & Environmental Science.
14. Solar energy for electricity and fuels, Olle Inganas.
15. Maximilian B. Gorensek, Claudio Corgnale, John A. Staser, and John W. Weidner (Article in Electrochemical Society Interface · April 2018)
16. Solar water splitting: efficiency discussion Jurga Juodkazyt, Gediminas Seniutinas , Benjaminas Sebeka, Irena Savickaja, Tadas Malinauskas, Kazimieras Badokas, K¸estutis Juodkazis, Saulius Juodkazis

17. Solar Thermochemical Hydrogen Production Research (STCH), Thermochemical Cycle Selection and Investment Priority, Robert Perret.
18. Basics of Photoelectrochemical water splitting for Hydrogen Production, Anamika Banerjee, January 2015.
19. Photoelectrochemical Cells Overview BY F. Decker, S. -Cattarin Encyclopedia of Electrochemical Power Sources.
20. Comparative Photoelectrochemical Study of PEC Solar Cell Fabricated with n-TiO 2 Photoelectrodes at Different Temperatures and under Different Oxygen Flow Rates, Praveen Raman Mishra, P K Shukla, O.N. Srivastava, June 2006
21. Hydrogen Generation by Water Electrolysis, Naimi Youssef, Amal Antar, August 2018
22. Radenka Maric and Haoran Yu, Proton Exchange Membrane Water Electrolysis, (Submitted: February 15th, 2018, Reviewed May 4th, 2018, Published: November 5th, 2018), DOI: 10.5772/intechopen.78339
23. Development of Hydrogen Electrodes for Alkaline Water Electrolysis, Kjartansdóttir, Cecilía Kristín
24. Alexander Schenk, Viktor Hacker, in Fuel Cells and Hydrogen, 2018
25. Hydrogen Production Technologies: Current State and Future Developments, Christos M. Kalamaras and Angelos M. Efstathiou
26. Hydrogen production using photobiological methods, Authors: Roshan Sharma Poudyal, Indira Tiwari, July 2015
27. Hydrogen production from cyanobacteria, February 2005 Authors: Debajyoti Dutt, Debojyoti De Surabhi Chaudhuri, Sanjoy Bhattacharya
28. Hydrogen production from renewables: Biomass, December 2019, Authors: Turgay Kar, Suleyman Keles.
29. Hydrogen production from biomass, January 2007, Authors: Nick Florin, A. Harris
30. Biomass Gasification: A Review of Its Technology, Gas Cleaning Applications, and Total System Life Cycle Analysis by Kenji Koido and Takahiro Iwasaki DOI: 10.5772/intechopen.70727
31. Production of Hydrogen from Biomass-Derived Liquids, Stefan Czernik, Richard French, Calvin Feik, and Esteban Chornet
32. Liquefaction Processes of Biomass for the Production of Valuable Chemicals and Biofuels: A Review, 2018
33. Fermentative hydrogen production using pretreated microalgal biomass as feedstock
34. Bio-Hydrogen Production from Food Waste through Anaerobic Fermen-

tation, December 2014, Authors: Uchechukwu L Osuagwu
35. Hydrogen from biomass gasification, Matthias Binder, Michael, Kraussler, Matthias Kuba, and Markus Luisser, edited by Reinhard Rauc, Published by IEA Bioenergy, 2018.
36. Bioprospecting of Microbes for Biohydrogen Production: Current Status and Future Challenges, November 2019, Authors: Sunil Kumar, Sushma Sharma
37. Can Green Hydrogen Production Be Economically Viable under Current Market Conditions, by David Jure Jovan and Gregor Dolanc, 14 December 2020,
38. Hydrogen Storage, Distribution and Cleaning Study in collaboration with AGA AB, Apoorv Gupta, July 21, 2017.
39. Hydrohen Storage: State of the Art and Future Perspective
40. Materials for Hydrogen Storage, September 2003, Authors: Andreas Züttel
41. Hydrogen Storage for Energy Application By Rahul Krishna, Elby Titus, Maryam Salimian, Olena Okhay, Sivakumar Rajendran, Ananth Rajkumar, J. M. G. Sousa, A. L. C. Ferreira, João Campos Gil and Jose Gracio Submitted: March 2nd 2012Reviewed: July 2nd 2012Published: September 5th 2012 DOI: 10.5772/51238
42. Hydrogen storage methods, Andreas Züttel, April 2004
43. Storage of Hydrogen in the Pure Form Manfred Klell
44. Hydrogen storage in carbon materials – A review, Man Mohan ، Vinod Kumar Sharma، E. Anil Kumar، V. Gayathri
45. Review of Solid-State Hydrogen Storage Methods Adopting Different Kinds of Novel Materials, Renju Zacharia, 13 Oct 2015
46. Review of Solid-State Hydrogen Storage Methods Adopting Different Kinds of Novel Materials, October 2015, Authors: Renju Zacharia, Sami -ullah Rather
47. Chemisorption, physisorption and hysteresis during hydrogen storage in carbon nanotubes, January 2014, Authors: Seyed Hamed Barghi, Theodore T. Tsotsis, Muhammad Sahimi
48. Chemical and Physical Solutions for Hydrogen Storage, December 2009, Authors: Ulrich Eberle, Michael Felderhoff, Ferdi Schüth
49. Hydrogen storage in carbon nanotubes and related materials February 2003, Authors: Gautam Gundiah, A. Govindaraj
50. Carbon nanotubes and related structures – Peter J. F. Harris
51. Hydrogen storage in carbon materials, A review, Man Mohan Vinod Ku-

mar Sharma E. Anil Kumar V. Gayathri

52. Hydrogen Storage in Metal-Organic Frameworks December 2011, Authors: Myunghyun Paik Suh, Hye Jeong Park, Thazhe Kootteri Prasad, Dae Woon Lim.

APPEARANCE AND DEVELOPMENT OF URBAN RENEWAL – EFFECT OF APPLICATIONS TO DISADVANTAGED SECTIONS ON URBAN ECOSYSTEM[1]

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INTRODUCTION

Urban renewal issue defined differently by many researchers, thinkers, writers and academics in the world, especially the definition areas that are corrupted within the city and disrupt the urban integrity are restored, revitalized and made reusable in the manner that will also not disturb the integrity of the city and damage the urban fabric, without ignoring the social, physical, environmental, economic, etc. conditions in the society has begun to reconstruct the collapsed areas, and there exist various differences in the applications according to the countries' economic and social situations in the forthcoming years.

The fact that people who had migrated to the cities together with industrialization resolve the housing problems on their own in an unfit way has triggered urban renewal in the coming years. Many strategies were pursued according to the economic, social and environmental factors about urban transformation, and each passing day, cities more similar to each other was begun to be built. These transformations started to have been implemented in the 1800s around the world has just become a current issue at the end of the 90s in our country.

As in the world, people have also started to migrate populously to major cities along with industrialization in our country, suggesting that this leads to problems of housing deficit and solutions-to-be generated cause the city to transform into collapsed areas.

The concept of urban transformation has nowadays become the most important issues of urban planning. In tackling the different transformation problems in our country, the overall transformation problems have been reduced to physical space transformation. The social, economic and environmental dimensions of this transformation have been ignored. If we outline the problems in practice, urban transformation projects to be implemented by successive laws and regulations which have issued in recent years deal with urban spaces abstractly in eco-

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nomic, social and cultural respects, and abandon the cities to market functioning by reducing the transformation to a physical size. At the present time, the urban transformation projects do not touch on people's social, economic and cultural conditions, and take into account of public participation and demands.

1. What is Urban Transformation?

Urban regeneration defines many times within the historical process. If we mention several definitions in order to provide an integrity due to depth of subject, urban transformation is way of reintegrating urban areas, which are lost their features over time, impaired and became old in physical and environmental aspects and faced with the exclusion socially and economically, into the city by renovating/transforming with certain social and economic programs (Bayraktar, 2007:287).

Urban renewal includes the transformation of unfit areas caused by illegal settlements in the cities, old areas due to dilapidation at places where historic buildings stock are intensively located, city centers that lose their function and the areas to be directly affected by natural disasters, and reintegration of areas such as abandoned or emptied factory, port, etc. into the urban (Özden, 2004).

The word "transformation" or "renewal" bears some meanings such as the alteration or conversion something from existing state to another one as lexical meaning. In this context, if we will define urban renewal in the simplest term, we can express "urban renewal" as an alteration in the current state of the city. Because, Karadağ says in his article that urban renewal states the whole of strategies and actions implemented for improvement on economic, social, physical and environmental conditions of decayed and collapsed urban areas through comprehensive and integrated approaches. However, Turkish Language of Turkish Language Society defines urban transformation as "the reconstruction of collective settlements compatible with plan after pulling down unauthorized buildings incompatible with development plan" (Karadağ, 2008).

The situation that will never change and is of the essence of urban transformation means to be improved the deteriorated urban areas in terms of economy and social, especially the physical and environmental conditions, even if differences exist in the definitions according to vision, objectives, strategies and practices.

Urban transformation is a concept that consists of four basic dimensions, which overlap with each other, including "physical, social, economic and legal / administrative". Urban renewal applications, which rise in importance day by day and have a common area of utilization, are renovation and development projects required to be evaluated in detail from social and technical aspects (Koçak,

2011:263).

Engels also dwells on the issues of urban renewal, urban segregation and expulsion urban poor from the city with great foresight. Engels reports that an interference in living quarters of urban poor by dominant class and legitimization no matter what happens is fulfilled in an attempt to transform city center into a luxury city and exile the poor from the city (Yücel ve Aksümer, 2011:129).

If we generalize based on the above definitions, urban renewal or transformation means that the areas, which are corrupted within the city and disrupt the urban integrity, are restored, revitalized and made reusable in such a way that will also not disturb the integrity of the city and damage the urban fabric, without ignoring the social, physical, environmental, economic, etc. conditions in the society.

2. History of urban transformation

As in numerous fields, the initial idea for urban transformation also appears in the developed western countries. In parallel with changing circumstances of the period and development level of the countries, the thought that the cities should also keep up with this development was a phenomenon that had commenced the urban transformation.

Following the Industrial Revolution, inhumane conditions of working class in Europe's major cities have deeply influenced many thinkers and planners, and accelerated the emergence of the first idea for urban renewal (Polat and Dostoğlu, 2007:63). Urban transformation has begun to reconstruct the collapsed areas in towns, and there have been various differences in the applications according to the countries' economic and social situations in the coming years. The fact that people who had migrated to the city together with industrialization resolve the housing problems on their own in an unfit way has triggered urban renewal The fact that people who had migrated to the city together with industrialization resolve the housing problems on their own in an unfit way has sparked urban renewal in the coming years. The necessity of reconstructing the areas that was destroyed as a result of wars had been another factor that had stimulated the urban transformation. Urban renewal applications have supported by public fundings in most of European countries until the 1970s, and new practices, including public, civil society and private sector, have started to be implemented in the period after 1980, (Sönmez, 2005:16).

As from the mid-19th century, significant achievements have gain through urban transformation to resolve the physical, economic, social and cultural problems, which occur in the developed Western Europe countries. In consequence

of these significant achievements, underdeveloped or developing countries was starting to regard urban renewal as an important tool to be utilized to solve the urban problems after the 1950s. In the first periods, the main aim was to overcome physical and economic force of collapsed areas. Since the 1990s, a great importance has gained to iron out the social and cultural disadvantages the area has (Göz, 2008:8).

Western European countries implemented their own plans for urban renewal with the contributions of Green paper that was prepared by the European Community in 1990 and that also included urban environment. Studies starting with the revitalization of cities have been following by studies on sustainable cities. These studies reveal what sort of main tasks and service areas required to be performed by central government and local administrations about these matters are, while fundamental principles and frame constructions relating to urban renewal are formed (Özden, 2000:264).

In the period after 1990, urban development and revitalization were the most commonly form of intervention used in urban renewal. Multi-actor and multi-sector transformation processes were recognized during this period. Voluntary agencies, non-governmental organizations and different social sections, as well as public and private sector, were also encouraged to participate in the project. In this period, it was understood the importance of the link between historical and cultural heritage and economic development, and therefore, the concept of "urban preservation" in the "urban renewal" also came to the forefront (Karadağ, 2008).

If we carry out a general evaluation, continuous changes / transformations have occurred in the cities from past to present. Many strategies were followed by the economic, social and environmental factors about urban transformation, and each passing day, cities more similar to each other was started to be construct. These transformations started to have been implemented in the 1800s around the world has just brought to agenda at the end of the 90s in our country.

3. What are the purposes of urban transformation?

Continuous changes have been observed in the towns since the day when the concept urbanization occurs. Many problems arise according to national geographic, social and economic situation, and these issues are required to be made alteration/transformation. The physical conditions underlie these issues. Increase in the number of people living in urban areas has incredibly revealed the housing deficit, which suggests that temporary squatting or unplanned urbanization/settlement solution to this issue poses a new problem. It is inevitable that a transformation has made in these old and risky settlements.

Needless to say, urban transformation is not just limited to the regions with the squatting and unplanned settlement. The main objectives of urban renewal include to ensure that urban people can live in more peacefully and healthfully – in other words that urban standards are improved.

As shown in Figure 1, we can specify the urban transformation goals.

1. To prevent urban areas becoming collapsed by investigating the fundamental causes of social disintegration and eliminating these causes,
2. To fulfill the need for physically constant change of many elements composing the urban pattern,
3. To build/develop a successful economic development model in a way that will enhance urban prosperity and quality of life,
4. To formulate the strategies for utilizing the urban areas more efficiently and for avoiding unnecessary urban sprawl,
5. To ensure civil society organizations and different segments of society to participate in the planning in an effort to meet the needs for designing the urban policy as a product of social conditions and political power.

Reduction in social exclusion	Enhancing urban prosperity and quality of life; Ensuring economic competitiveness	Ensuring that participants take part in the planning
	Main goals of the urban transformation	
Efficient use of the urban; preservation and development of the environment	Integration of the areas subject to transformation into whole of the city	Fulfillment of the need for inherent constant change in the urban areas

Figure 1: Main goals of the urban transformation (Yüksel and Özdemir, 2007)

Yet another aim and role of urban transformation are to transfer the city's cul-

tural heritage to the future generations and to preserve the city's historical and cultural fabric. Historical buildings found in both public space and belonging to private persons are taken under special preservation by law. Moreover, it is imperative to renovate them and continue their existence (Yasin, 2005:127).

If we will separate the emerging reasons for urban renewal into ordinary and extraordinary based on these basic objectives, the ordinary reasons for urban renewal are emerging as a result of probable situations in which each city will encounter in normal development process. These are an outcome of the changes and urban growth that occur largely in the urban economy and city's social structure in time. Events such as immigrations, industrialization, transformations experienced in the central business space, the emergence of new centre of attention and creation of new housing zones ultimately cause the existing areas to enter in the process of collapse / dilapidation by losing their former significance. The resulting causes of urban renewal from these different developments are possible to also indicate reasons arising out of dilapidation and unplanned developments. Extraordinary reasons are wars, terrorist attacks, big fires, industrial accidents and natural disasters that produce great demolitions and devastations to the city, in addition to loss of life and property. This type of urban renewal explaining to return settlement to its previous condition and even improve better now than before following the extraordinary events takes place terms such as transformation or renewal, reconstruction, etc. in literature.

The existence of certain principles requires in order to achieve urban transformation's aims. Considering these principles, urban renewal aims both to make a positive contribution of urban areas to economy and to reach the environmental objectives. In other words, the goal of urban renewal is to show a successful economic development approach to boosting the urban welfare and quality of life. One of the most important reasons to turn the urban areas into collapsed sites, in addition to physical and social degradation, is that these sites languish economically. Urban transformation projects aim to develop strategies, which will bring an economic vitality to urban parts that become physical and social collapsed areas, and to improve urban welfare and quality of life (Akkar, 2006a).

There are many methods for being adopted to accomplish all purposes of urban renewal. These methods vary by various sources. Some researchers confine these sources to four headings as others have addressed them in most detailed under 10 headings. If we outline these applications, they are:

- Refurbishment,
- Conservation,
- Restoration,

- Gentrification,
- Rehabilitation, and
- Redevelopment

As we have noted above, however, all of them are not methods that are always articulated or continuously used. We can be briefly stated the most common ones used among these methods.

Redevelopment

An approach to redevelopment is adopted in the places where severely destroyed and too worthless buildings to be preserved are located. This approach usually envisages settling original urban population in another urban part, which in turn brings excessive social and environmental costs. Both old buildings and an operational social system are ravaged while destruction of neighborhood for tenants, owners and employers leads to social and psychological losses. Experts report that breakdown of families and friends damage heavily elders most particularly. Redevelopment method is an expensive event when payment of expropriated prices, infrastructure development and amounts spent to build public facilities take into consideration. This is required government support since local administrations need too sizable investments to be covered on their own (Karadağ, 2008).

Rehabilitation

Rehabilitation aims to bring planned-developed but worn, non-functional sites to life, and to make these areas valuable. It mainly includes restoration and repair of relevant areas by maintaining the structure of area.

Integration

Urban identity maintains with this method and a rich environment is established by building new buildings next to existing structures. Area residents cannot leave from the site and contribute to transformation. New buildings to be erected near to current structures also display examples of contemporary architecture.

Conservation

Urban conservation can be describe as being prevented physical structure reflecting past social and economic conditions and cultural values from disappearing under today's changing social and economic conditions and being survived by integrating with contemporary society and contemporary developments (Engin, 1997:129)

Refurbishment

Depending on the development and alteration of urban functions and social-economic structuring, urban renewal process occurs as a result of the requirements for urban areas entering into the process of aging and dilapidation. Therefore, urban renewal is implemented in both historic city centers and old patterns in different regions. Urban renewal can be defined as reconstruction after demolishing old sites and spaces in urban structure and also considered as removal of aging and dilapidation. Thus, urban renewal can also say to have a dynamic property. In other words, renewal is an emergent reaction against aging. Urban renewal is a type of action, which is aimed to ensure that old urban areas are destroyed and redeveloped them through the arrangements for physical environment and infrastructure project at later stages (Öztaş, 2005:77).

If we make an overall general assessment of the fields of application; various applications such as "the elimination of the city's collapsed areas and renovation and re-development works performed in order to make them liveable, and preservation of historical and cultural sites and improvement and conservation works made not to be destroyed the city in subsequent natural disasters" underlie urban transformation.

4. Urban Renewal in Turkey

Urban transformation is a process that involves all the cities in the world. There certainly exist similarities in the urban renewal. However, this alteration varies by a country's economic, geographical and cultural structure. It still varies by economic, historical, political and social phenomena in the transformation encountered in our country's towns. The important matter is that renewal should take care to be accurate by benefitting from the experience in urban transformation of more developed countries than our country.

As in the world, people have also started to migrate populously to major cities along with industrialization in our country, suggesting that this leads to problems of housing deficit. Unplanned urbanization, unfit dwellings and urban poor housings are erected since this problem should solve as immediate as possible. Presence of all these problems necessitates urban renewal. An important feature of the 1950s and 1960s is that they are restored after collapsed areas in the city center are totally destroyed (Uzun, 2006:49-52). Pursuant to followed modernization policies, squatter settlement located immediately adjacent to planned-developed areas in large cities are transformed into regular urban parts through "additional development plans" that are prepared. In this period, legalization and transformation of the slum areas have been a continuous matter of negotiation between the

governments and slum owners (Sönmez, 2006:122).

In Turkey, a political authority to be implemented freely came into power in an environment where there was no neo-liberal policies and opposition and where public order was provided by the military in 1983. In this period in which export-led development strategy was adopted as national development strategy, an approach to the opening for market dynamics and actors of urban areas as development sector was adopted in order to increase the growth rate. To that end, legal and administrative arrangements have been implemented. Concordantly, local authorities are entrusted with more broad authority, and this excess of authority initiates the procedure for an urban renewal, which militates in favor of specific classes and interest groups and is based-creating unearned income at political plane with dominant clientelism-affairs (Kurtuluş, 2008:316-317).

In the 1990s, globalizing effects began to feel more in our country. In addition, the process of transition to European Union has cause to come into the prominence of policies for alignment with the acquis and practices of urban transformation. Today's urban rehabilitation projects are using the images to be risen the prominence of existing urban historical and cultural heritage, rather than creating new images for the cities, in urban marketing programs. It is increasingly understood the importance of strong link between historical and cultural heritage and economic growth (Akkar, 2006b).

The concept of urban renewal has today become the most important issues of urban planning. Many municipalities, especially housing development administration of Turkey (TOKİ) and metropolitan municipalities, have tried to present a wide array of projects ranging from the rehabilitation of slum areas to large projects even attracting the attention to international capital and real estate investment trusts. Furthermore, EU, World Bank and international credit institutions and banking system encourage to finance these projects. Experienced rapid development leads the need for urban renewal to arise in a shorter span of time in our country. Approaches to urban renewal and refurbishment are supported by especially recent laws in the big cities like İstanbul, and they are applications that have eagerly been embraced by local administrations *(Kaya, Şentürk, Danış and Şimsek, 2007:134)*.

It started to be discussed in academic community through Symposium on Urban Renewal held by Union of Chambers of Turkish Engineers and Architects (TMMOB) Chamber of City Planners (SPO) in 2003 as urban renewal issue in Turkey was more often brought to agenda after the 2000s. In 2004, this issue was for the first time discussed with international examples and concrete solution recommendations at "International Symposium on Urban Renewal Applications:

Küçükçekmece Workshop" held in cooperation with Union of Chambers of Turkish Engineers and Architects (TMMOB) Chamber of City Planners (SPO) and Küçükçekmece Municipality (Özden, 2007:197-225).

İstanbul, the fastest-growing city of Turkey, witnesses intensively various types of urban transformation projects laid by both social interference-intervention and non-social interference-intervention (Kahraman, 2006:93-101). However, there have been many provinces where the projects are implemented, and different projects are prepared according to the provinces and even regions in the relevant province. These projects can be listed in general terms as the following:

- Transformation of collapsed areas/slum areas,
- Gentrification,
- The transformation of the central business district,
- Preservation of archeological sites and tourism intended transformation,
- Transformation projects launched under the leadership of TOKİ, and
- Urban transformation due to natural disasters.

In tackling the different transformation problems in our country, the overall transformation issues have been reduced to the transformation of physical space. The social, economic and environmental dimensions of this transformation have been overlooked. However, urban renewal can accomplish, supposing that it deals with comprehensive and integrated approaches together with social development, economic development, and preservation of the ecological and natural balance and ensuring the sustainability, as well as the transformation of physical space. Public and private partnership in the projects carried out within the scope of urban transformation is understood to concentrate only at city centers where urban restructuring is attractive and where value of unearned income, namely share of unearned income, is high. This is criticized in the way that urban renewal projects are developed as unearned income sharing model. It is also noted that these projects implemented in the city centers could hardly be fully integrated with the surrounding physical and social structure (Göksu, 2003). Issues such as transformation projects being implemented in our country, the influence of these projects on the people found in the areas where they are implemented, etc. will be discussed under a separate heading in the following sections.

Finally, if we will examine laws based on urban renewal that grows in its importance the world over and in our country and is supported by the laws, we can list in that way:

The leading law we will talk about this matter is anti-squatting law that entered into force in 1966. Squatting had been denied in our country for many years and accepted in 1960s, and ultimately was entered into struggle period against it

by law in 1966. The struggle against shanty settlements means improvement of slum housings, suggesting that we can consider arrangement works in those areas as the beginning of urban renewal. Numbered 2981 "some processes to be implemented about buildings built against development and slum legislation" issued in order to regulate operations to be applied about all buildings that was under construction and built against development and slum legislation in 1984, and numbered 6785 "law on being changed an article of the construction law" have confirmed my argument.

If will address later studies, it commences to make dwelling production more suitable for urban geographical structure with especially mass housing law and wo

rks performed in this area. By also taking disaster risk to these housings into consideration, it has recourse to an unhealthier and protective structuring. Subsequent laws have focused on the transformation of unhealthy areas. Urban renewal projects are included in the article 73 of the numbered 5393 municipal law. Other legislative regulations we will specify about this matter are numbered 5366 law on Preservation by Renovation and Utilization by Revitalizing of Deteriorated Immovable Historical and Cultural Properties, and numbered 6306 Law on Transformation of Areas under the Disaster Risks.

When examining the relevant regulations, it should be noted the ninth development plan covering the years 2007-2013. There has not been any provision determining a policy directly on urban renewal and urbanization in the plan. However, articles 681 and 645-659-679 mention some relevant regulations.

5. Role of Local Governments in Urban Renewal

Local governments in Turkey, are the most active element of urban renewal under legal regulations. Because, urban renewal; both the construction sector and employment policy are both an important source of financial resources for local governments and an important tool of social transformation.

Urban renewal is a process that can be performed within a whole of strategies. Local governments play important roles in forming and implementing these strategies. Local governments should perform their duties by sharing the different institutions and organizations and by job-sharing according to socio-cultural, economic, cultural and physical-spatial qualities (Özden, 2000:264). As we focused on when speaking of legal foundations of urban transformation, I touched on the subject of efficiency of local governments in the urban transformation within the context of the numbered 5393 municipal law and numbered 5366 law on Preservation by Renovation and Utilization by Revitalizing of Deteriorated Immo-

vable Historical and Cultural Properties. If we will make a detailed description under a separate heading on the subject of urban renewal, we can put forward the following implications.

The numbered 5393 municipal law touches on the subject of urban renewal by this means: "Municipalities can be implemented urban renewal and development projects so as to reconstruct and restore old urban parts in accordance with the urban development, to build residential areas, industrial and commercial areas, technology parks and social facilities, to take measures against earthquake risk or to preserve urban historical and cultural texture."

As I mentioned at the beginning of the subject, another law on urban renewal is numbered 5366 law on Preservation by Renovation and Utilization by Revitalizing of Deteriorated Immovable Historical and Cultural Properties. The purpose of this legislation is specified in the first article in that way. The aim of this act is to be built dwelling, trade, culture, tourism and social facilities areas in these regions, to be made provisions against risks to natural disasters, to be preserved by renovating and utilized by revitalizing the deteriorated immovable historical and cultural properties by metropolitan municipalities, district and first degree municipalities within the boundaries of metropolitan municipalities, provinces and districts municipalities, municipalities over 50,000 population, provincial private administrations beyond jurisdiction of these municipalities by reconstructing and restoring "worn-out" and degraded areas, registered and declared heritage sites by cultural and natural heritage conservation board and protected areas related to these sites in accordance with the urban development.

In both laws, local governments perform certain tasks of renewal. However, as is also understood from the articles and as is seen in practice, these articles remain insufficient. Our distinguished academician Pelin Pınar Özden (with many studies and a book on the subject) also emphasizes that local authorities become more ineffective in this regard and they are more active regarding the issue than before. She lists tasks to be assigned local authorities under those articles.

1. Local authorities are obliged to prepare urban renewal projects in collapsed areas of the cities so as to develop the cities properly and suitably.
2. Local authorities establish "urban renewal offices" within themselves to perform this task. These offices employ architects, urban planners, landscape architects, civil and environmental engineers, sociologists, lawyers and economists.
3. Local authorities prepare an urban renewal program to carry out the urban renewal projects.
4. Local authorities work in coordination and cooperation with KTVKK for

the purpose of preserving and protecting the urban cultural heritage in both decision-making processes and implementation phase while implementing the urban renewal applications.

5. Local authorities act on their views by also collaborating with relevant professional chambers. In this end, "Advisory Board" consisted of representatives of the relevant professional chambers takes part in the decision-making and implementation processes of the local authorities.
6. A committee composed of people resided in that place will be involved in the decision-making process relating to renewal projects.
7. An "Urban Renewal Research – Applications Fund" is founded to resolve financial problems that will arise during the implementation phase of the urban renewal projects. Research and project costs are defrayed from this fund. Taxes to be levied on property owners in exchange for increased values in the renewal areas are still transferred to this fund, thereby maintaining its continuity.

6. HOW SHOULD URBAN TRANSFORMATION OR RENEWAL BE? WHAT ARE GAPS AND WRONGS IN PRACTICE?

While preparing an urban transformation project, it should plan from various aspects ranging from physical, economic, social and environmental conditions to legal, institutional, financial and partnerships in the conduct of project, and accordingly, transformation programs should be prepared. How whoever will be involved in this partnership can be determined in different ways according to the project. This partnership can also be formed between more than one public institutions, as can be established a partnership between public sector and private sector. And, what's more, project will become more meaningful in case those publics are also involved in this partnership.

Urban renewal projects must be death with an integrated and coordinated approach. Today, public should also play an essential role in the decision-making processes in Turkey, as in the Western Nations. An advanced urban governance can make differences in the urban transformation processes. For this, it is essential that government understands the market and public. Local public participation in these processes is important to prevent waste of resources arising from having subsequently changed the decisions made against city's interest groups, to democratize the decision-making process, to deliver the commitments to decision-implementation and to promote social learning (Ataöv, 2005:74).

Participation means that all relevant people at the region/city involved in the project are participant and take an active role in decision-making process. So, this

will be easier to make decisions and the parties will less object to the decisions that were made. Consequently, this will facilitate the feasibility of the project. In addition, different disciplines such as sociologists, economists, engineers, architects, planners and landscape architects should collaborate in all of planning works in order to devise a more robust project.

An article by Ataöv on the subject describes as "transformation is a process that evolves within its social dynamics". This process also includes its relation layers, as well as physical structure of the transformation. In this context, he said "the phases of the transformation process, structural properties that affect every stage, actor interactions and relationships also need to understand".

7.Situation and Gaps in Practice in Turkey and Their Impact on Urban Ecosystem

Legislative arrangements relating to urban transformation are also discussed within the scope of implementations, and are criticized by especially professional chambers (TMMOB City Planners (SPO), Chamber of Architects (MO), YAYED, etc.) and academics. The existing legal regulations and lack of coordination in Turkey are the most important challenges that are raised to urban renewal applications. It is deemed them insufficient although there exist some legal regulations concerning to the subject and significant arrangements concerning to the matter have made within the scope of recent local governing legislations. For example, this law remains insufficient due to the lack of information about how and in what way the scale of urban transformation implementations will implement, what time of implementation will be and what technical and social conditions necessary for providing in the field of application will be, even though numbered 3194 Law on Public Improvement is one of essential reference sources for urban transformation implementations (Ceylan and Kutlu, 2007:113-122).

Draft of a law attempted to be introduced about the transformation in Turkey has been criticized at many points and Fatma Nevval GENÇ has collected these criticism of transformation under the following main headings in her article:

- The draft does not overlap with a holistic approach to plan.
- The draft is unearned income-purposed rather than the solution and creates new areas of issue.
- The draft is far from the concepts of social benefits, social justice, urban integrity and urban well-being.
- The draft predicts urban development based on urban projects driven by financial environments, not planning.
- The process is left to the private sector and market intervention.

- It does not collaborate with professional chambers and universities while drafting.
- Urban transformation is perceived as the solution to every problem.
- The draft is not fully revealed criteria determining the transformation areas.
- The draft has the provisions directing the preparation of the transformation projects by neglecting planning principles, public interest and urban integrity.

In Turkey, its implementation is criticized by public opinion, as well as the debate over the draft law. Overall, occurrence of problems in the implementation is considered as having experienced very rapid urbanization and transformation and having turned the cities into unearned income housing. Apart from these, another factor is that our buildings are not built firmly and lastingly.

Some problems can arise in transformation implementations, such as ownership structure, insufficiency for economic conditions of landholdings, planning system, lack of organizational structure, lack of legal regulations and insufficiency for ability to fund the projects.

To solve this issue, the projects should become stakeholder and all necessary stakeholders must be active participants in the project.

Urban regeneration means that they are rebuilt, made additions to them, refined, and refunctioned from physical, economic and social aspects so that underdeveloped urban areas gain their former importance. Considering the applications, however, it is apparent that there is not a refurbishment covering all of these issues.

Renovation projects implemented in our country – more clearly renewal decisions taken by political power – have faced heavy criticism on many issues. Response has sometimes shown to them by forming unions not to implement these decisions.

They raise the awareness of local public about implementations and function positively by ensuring that decision-makers direct to make arrangements, which will meet the local people's demand and expectations even though these activities undertaken by both professional chamber and academics and non-governmental organizations in favor of / against the urban transformation projects appear negative (Görün and Kara, 2010:145)

Urban transformation in Turkey emerges as daily and spontaneous evolving solutions, rather than being conducted within the scope of a specific plan. The policies that rapid urban transformation process will project and that will systematize cannot be developed at an equal rate. It is indicated, therefore, that the most

important difficulties occurring in the implementation of urban transformation are the deficiencies/gaps in present legislative regulations and lack of coordination (Genç, 2008:115-130).

In Turkey, it has tried to bring some solutions to the physical dimensions of urban problems over the past fifty years, but sustainable solutions could not be generated for social, economic and environmental conditions. New approaches and practical tools need so that urban transformation can also be brought about the transformation of the social dimension. In this context, it is primarily necessary to determine the transformation areas at urban scale. For this, based-reliable information production is of primary importance. There are need for the creation of different economic sectors and employment, development of social life, improvement to the living standards, collective activities and the creation of spaces to allow them, as well as the changes in the physical environment, in the urban transformation areas. Transformation implementations must be managed in a way to contain different stages with an approach to participant planning in order to produce ready-made solutions "suitable for situation" instead of ready-made solutions "suitable for every situation". Links between physical, economic and social transformation and process must be taken into account and it should be avoided one-dimensional attempts (Ataöv and Osmay, 2007:57-82).

As I also stated at the beginning of the issue, transformation projects in our country have not been addressed as a multi-dimensional, and therefore, some problems have experienced in implementations. It will be helpful in explaining the problems experienced and impact of these problems on urban ecosystem by giving examples of major projects in our country. However, it is helpful in touching upon legal regulations about how to negotiate with people involved in this project and what to happen if any agreement cannot reach, before all of these.

Article 5 of Law No. 6306 is clearly arranged that lodging or rent allowance will help and/or assign to occupants evacuated from a risky building by settling with state or tenants if not occupants or those resided in these buildings as limited real right owner. Apart from this, it is also discussed to issue certificate of housing to these people and to give them housing loan according to the same agreement.

Urban transformation was first responded negatively by the citizens in our country. They objected to urban transformation for the fear that citizens, especially low-income families, would displace their home throughout the country. But, an earthquake, which had been happened in Van recently, showed citizens to the nitty gritty and unearthed once more the need to restore or renew the buildings. Prime Minister Erdoğan has already said in his statement that "no one would stay under the debris when an earthquake occurred in our country after this!" Beca-

use he said “all risky about to collapse buildings would demolish at the earliest opportunity and new ones would be built”, and once more focused on the necessity for urban transformation. People applied to municipalities and wanted to be involved their own homes / neighborhoods in the urban renewal/transformation projects after both these statements and these truths uncovered once more by the earthquake. Insofar, everything is in place and as it should be. But the problems experienced uncovered the negative aspects of the project when we returned to implementation process after all these developments. Many problems have encountered, such as rent seeking, attempt to avoid tax and relationship breakdown.

Minister Bayraktar presenting some statements at Developing Cities Summit held by the association of real estate investment companies (GYODER) and supported financially by ministry of environment and urbanization and Samsun Municipality has expressed the experienced problems, and accepted that there were severe abuses in the projects and especially elders were unjustly treated. Projects aimed at the transformation in the risky areas were conducted in a way not to much go beyond an understanding that was mostly implemented in areas with high value and that was rebuilt by destroying. The process has turned into a situation, which was carried out by the contractor and was sought for rent. For example, Kadıköy has become a current issue for a longer time and declared one of the most risky areas. But, main risky places are not determined since it directs towards areas with high-value.

The concept of sustainability in the planning is only discussed about the strength of the building and apart from this, it has not been touched on arrangements such as landscaping, parks, green spaces, and cultural sites.

Rent-seeking underlying these projects damages ecosystem, disputes have been experiencing among citizens themselves, friendship and neighborhood relations lasting for many years have been deteriorating, and there is no study to solve these issues and problems.

An opportunity to be exempt from taxes of right owners in risky urban transformation areas within the scope of the project was started to misuse, and opportunists who want to get rid of burden of tax have emerged although they did not reside in risky buildings.

Yet another source of rent in the project was that had helped big companies inadvertently in the projects implemented and paved the way of providing new loan facilities by banks. This affects worker-laborer families and these families are left homeless by urban transformation laws enacted and, in the meantime, they fall into a debt trap to have struggled desperately for years so that they have a home to be dwelled.

Problems experienced in Sulukule project, which is the beginning of Sulukule urban transformation project, have evidenced the issues we mentioned from the beginning. People did not want the project at the beginning, differences of opinion were experienced between themselves, and neighborhood relations were deteriorated. People evacuated from their houses to be implemented and realized a project has been displaced in the areas where they would live detached from social life. The project has lasted for six years; they are not satisfied with the project since people tried to settle in their homes at the end of the project have a misfortune such as their debt expansion. People suggest that project was conducted in an improper manner for neighborhood culture and that existing order was dislocated.

To give another example, abandonment of settlements of people lived in the area prior to transformation due to the project in Dikmen prevents from using the project as a model to solve the housing problems of low-income groups. Leaving home/area by the slum owners, as well as tenants who did not participate in any process and assess their demands and needs, reveals that the problems experienced before the implementation of the project reached to outskirts (Özdemir, 2006:121-217).

Our recent history witnesses the examples of neighborhoods that are mostly displaced with reluctantly and impositions due to the urban transformation projects. Either illegal and unhealthy housing or dilapidated residential texture and otherness implication or transformation plan starting on the margin of relevant areas and covering its whole neighborhood over time become threat risk to all cities and citizen (Gül and Ergun, 2010a)

The most striking feature of urban transformation projects is that areas by habituated poor / marginalized populations determine as a target and displace them besides excluding people lived in transformation areas from the process.

The process of the displacement happens in such a way that people force to move standard multi-store buildings by built TOKİ elsewhere (usually far from the city center) at the beginning of the project as in Sulukule project and that neighborhood residents lived in Dikmen move to other places since they do not accommodate themselves to a new socio-economic structure. However, the overall outcome of the urban transformation project is that people resided in these areas compel to abandon their home by any means or is obliged to leave their home (Gül and Ergun, 2010b).

One of the biggest shortcomings of urban regeneration projects implemented in our country is projects to rebuild by demolishing, as we mentioned at the beginning of the subject. Strengthening works disregard in the projects sufficiently.

The fact that problems to be solved through a less cost and easier strengthening works try to resolve by reconstructing associates with an unearned income attempt.

State plays a role in favor of capital and wealthy segments during redistribution of property in urban spaces in urban transformation projects.

In this period, the government makes new legal regulations by pretending insecure property rights, the illegal history of settlements in the land and reconstruction problems in urban land, especially slum areas, and paves the legitimate way for transferring from the poor to the capital segment/the rich and upper-middle class (Gül and Ergun, 2010c)

In recent years, the fact that areas selected for urban regeneration projects implemented in Turkey, especially İstanbul, are usually slum areas or areas where poor /marginal segments have lived reveals the manner of perceiving the urban transformation in our country. Poor / marginalized groups and their living spaces fail to suit very well to the cities. These segments are rendered invisible to create spaces for multi-storey sites, skyscrapers, shopping malls that distort the entire silhouette of cities, which need to be built. These strategies for becoming invisible / displacement display that urban transformation being the most important tool of capital flow-oriented urban managers embodies the gentrification in itself (Gül and Ergun, 2010d).

When “urban transformation” mentions in our country, the concepts of “rent”, “division/sharing”, “spoliation” and “reconstruction amnesty” come to mind. First, it is necessary to overcome this “confidence” crisis. These words should be avoided to conceal the concept of urban transformation. For this, rule-making requirements should be participant and transparent, and control mechanisms must be defined. If urban transformations provide unearned income for some people, the return of this to the public should be clearly described.

If we will summarize the deficiencies/gaps and results in practice, urban transformation projects to be implemented by successive laws and regulations which have issued in recent years deal with urban spaces abstractly in economic, social and cultural respects, and abandon the cities to market functioning by reducing the transformation to a physical size. Today’s urban transformations projects do not touch on people social, economic and cultural conditions, and take into account of public participation and demands (Akkar, 2007:170-181).

Urban transformation projects can be successful by encouraging participation and including multi-dimensional plans. The current project implementations show that any participation is not unfortunately provided, the imposition dominates, neighborhood relations are deteriorated, local cultures and urban ecosys-

tem damage and certain segments provide unearned income (Köktürk, 2007: 49-66).

This process causes displaced-people to be confronted with even worse conditions from employment, housing and transportation aspects (Bıçkı, 2006:479-496).

8.Conclusıons And Recommendatıons

Urban renewal executions are done in an attempt to restructure the areas informed as unqualified and in a poor condition which ensue rapid urbanization along with the acceleration of industrialization with migratory increases. All around the world, by allowing for different technics and methods urban renewal executions are prepared and put into practice .

Main aim of projects applied in different ways according to the situation as social, economic and cultural etc. is given back deteriorated urban areas with that illegal construction or occupation on public land to city.

The fact with the migratory increases and along with the acceleration of industrialization housing deficit solved with in particular unfit dwellings and huts, caused to occur some problems later and these problems have been started to be solved with the gentrification and renewal as urban renewal executions

The mistakes occurred in the executions partly get reactions and the process occurred to militate in favour of some areas whereas it is the opposite for some the others.

Urban transformation projects displace the people living in the areas claimed to be the transformation area and the areas in which there is scarcely any possibility for housing acquisition. This can cause to occur new poor areas in process. Therefore, the projects , which are applied ,should encourage participation ;the aim of getting unearned income should not be allowed and just before the appliance of transformation ,the wishes of the public should be listened and the problems that can occur later should be worked out

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BIBLIOGRAPHY

AKKAR Müge (2006), "Kentsel Dönüşüm Üzerine Batı'daki Kavramlar, Tanımlar, Süreçler ve Türkiye", *Planlama* Magazine, Number. 36, P. 32-35

AKKOYUNLU Nihat (2010), "Açılımlı Dönüşüm ve Kentsel Yalanlar", Birgün Newspaper, (A.D.17.04.2010)

ATAÖV Anlı and OSMAY Sevin(2007), "Türkiye'de Kentsel Dönüşüme Yöntemsel Bir Yaklaşım" META JFA Number 2, P.74

ATAÖV Anlı, Preparation of the Strategic Plan of the Municipality (Meeting Report), Turkish Union of Municipalities and Konrad Adenauer Stiftung, 2005, Ankara.'dan ATAÖV Anlı ve OSMAY Sevin "TÜRKİYE'DE KENTSEL DÖNÜŞÜME YÖNTEMSEL BİR YAKLAŞIM" 2007, P.74

BAYRAKTAR Erdoğan;(2007) "Gecekondu ve Kentsel Yenileme", Economic Research Center Publication, Ankara, P. 287

BAYRAM A.Müfit (2006), "Kentsel Dönüşüm Yasa Tasarısı Üzerine" "http://www.yayed.org.tr//genel/bizden_detay.php?kod=227&tipi, A.D. 15.11.2013

BIÇKI Doğan(2006), "Kentsel Yeniden Yapılanma Çerçevesinde Mekânsal Yarılma, Kentsel Yoksulluk ve Türkiye, Dünden Bugüne Türkiye'nin Toplumsal Yapısı" , Ankara: Nova Press Release Distribution, P. 482

CEYLAN, Eda Çaçtaş, A.C. KUTLU (2007) "Yerel Yönetim Kavramı ve Kentsel Dönüşüm Projelerinde Yetki Karmaşası", TMMOB Transformation Symposium on Local Governance, P. 113–122

ENGIN Feridun, Related to Urban Conservation Model Research, Balat Örneği. YTÜ Institute of Science, Master Thesis, 1997, S.129'dan Koçan Nurhan "Uşak Kentsel Sit Alanının Koruma ve Süreklilik Bağlamında Değerlendirilmesi" Karadeniz Magazine of Science and Technology, Year 3, Volume 2, Number 6, P. 96

GENÇ Fatma Nevval (2008), "Türkiye'de Kentsel Dönüşüm: Mevzuat ve Uygulamaların Genel Görünümü", Management and Economics, Volume. 15, Number. 1, P. 123

GÖKSU Faruk (2003), Innovative Application Tools In Urban Planning (İHT-İHTr-Menkulleştirme), November 8th World Town Planning Day 27. Kolokyum "Şehircilikte Reform", TMMOB City Planners Chamber -Mersin University, 2004 P: 199.

GÖRÜN Mustafa ve Kara Mustafa(2010), "Kentsel Dönüşüm Ve Sosyal Girişimcilik Bağlamında Türkiye'de Kentsel Yaşam Kalitesinin Artırılması" Yönetim Bilimleri Magazine

GÖZ, Ali Cem (2008), "Kentsel Dönüşümün Esasları ve İskoçya Whitfield

Örneği", *Local Politics*, Year 3, Volume 31, July, P. 8

GÜL Hüseyin. Ergun Cem(2010), "Barınma Hakkının İhlal Edilme Sürecinde Kentsel Dönüşüm Projeleri" *National Symposium of Social Rights* P 9-.11

http://web.adu.edu.tr/user/fngenc/UserUploads/PDF/doktora.pdf, A.D.19.11.2013

KAHRAMAN Tayfun(2006), "İstanbul Kentinde Kentsel Dönüşüm Projeleri ve Planlama Süreçleri", Planlama Magazine, 2: 95

KARADAĞ Derya(2008), "Kentsel Dönüşümün Tarihi" www.v3.arkiterara.com, A.D. 8.11.2013

KAYA Erol, Şentürk Hulusi, Danış Osman ve Şimşek Sami,(2007) "Kentsel Dönüşüm/Yenileme", Modern City Management -I, Okutan Publications, P. 127

KOÇAK Hüseyin (2011), "Kent-Kültür İlişkisi Bağlamında Türkiye'de Değişen ve Dönüşen Kentler", Social Science Research, Number. 2, P. 263

KÖKTÜRK Erdal(2007), "Türkiye'de Kentsel Dönüşüm Ve Almanya Deneyimi", 2007, P.6

KURTULUŞ Hatice (2008), Türkiye'nin Kentleşme Deneyiminde Devlet, Sınıflar ve Kentsel Arazi Bağlantıları Devlet ve Sermaye'nin Yeni Biçimleri, Ed:R. Günlü, Chivi Publications , İstanbul, P. 316-317

Municipal Law No. 5393, http://www.tbmm.gov.tr/kanunlar/k5393.html, A.D. 08.01.2014

ÖNGÖREN Gürsel, Çolak İlker (2013), "Kentsel Dönüşüm Hukuku", İstanbul, Öngören Law Publications

ÖZDEMİR Sönmez, Nihan (2007), "Düzensiz Konut Alanlarında Kentsel Dönüşüm Modelleri Üzerine Bir Değerlendirme", Planlama Magazine Number 36 P.121

ÖZDEN Pelin Pınar (2007), "Yerel Yönetimler Üzerine Güncel Yazılar II, P.215 "

ÖZDEN Pelin Pınar(2004), "Kentsel Dönüşüm Projeleri." http://www.spoist.org/ Çalışma_Raporu/, A.D.08.11.2013

ÖZDEN, Pelin Pınar "Kentsel Yenileme Uygulamalarında Yerel Yönetimlerin Rolü Üzerine Düşünceler ve İstanbul Örneği", I.Ü. Faculty of Political Science Magazine Number: 23-24 October 2000-March 2001 P. 264

ÖZTAŞ Nihan, "Türkiye'de Kentsel Dönüşüm ve Haliç Örneklemesi." MSGSÜ Institutes of Science, Master Thesis, 2005, P. 77'dan Görün Mustafa ve Kara Mustafa "Kentsel Dönüşüm Ve Sosyal Girişimcilik Bağlamında Türkiye'de Kentsel Yaşam Kalitesinin Artırılması" Yönetim Bilimleri Magazine (8: 2), 2010 P. 145

POLAT Sibel ve Dostoğlu, Neslihan(2007), "Kentsel Dönüşüm Kavramı Üze-

rine Bursa'da Kükürtlü Ve Mudanya Örnekleri" Uludağ University Faculty of Engineering and Architecture Magazine, Volume 12, Number 1, P.63

SÖNMEZ Özbek İpek (2005), "Kentsel Dönüşüm Süreçlerinde Aktörler-Beklentiler- Riskler", Ege Architecture Magazine, Number: 53, İzmir, P. 16

SÖNMEZ Özdemir Nihan (2006), "Düzensiz Konut alanlarında Kentsel Dönüşüm Modelleri Üzerine Bir Değerlendirme", Planlama Magazine, P: 122.

The 1982 Constitution, http://www.anayasa.gen.tr/1982ay.htm, A.D. 09.01.2014

UZUN, Nil (2006), "Yeni Yasal Düzenlemeler ve Kentsel Dönüşüme Etkileri", Planlama Magazine, 2: 49-52

YASİN, Melikşah(2005), "Kentsel Dönüşüm Uygulamalarının Hukuki Boyutu" TBB Magazine, Sayı 60, S.127

YÜCEL Hakan ve Aksümer Gizem(2011), "Kentsel Dönüşüme Karşı Kent Hakkı Mücadelesi" Quarterly Journal of Education, Science and Society, Volume.9, Number 36, P.129

3D DESIGN AND MANUFACTURE OF ORTHODONTIC APPLIANCES

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1.INTRODUCTION

Technology and quality of life appear as a dynamic factor that can increase in every field. This leads people to constant change and innovation. Due to the combination of innovation and entrepreneurship, three dimentional (3D) writing technology has started to take an important place in our lives. 3D printing is a technical process in which 3D models can be printed from a physical 3D printer [1]. The model obtained digitally using a 3D printer, a computer-assisted program; It is a printer that creates a three-dimensional object by forming a thin layer on a plastic, metal, etc. two-dimensional plane, melting it in the printing process, and overlapping the layers. In the 21st century, 3D desing and manufacture has become a sector with the development of technology and the decrease in production costs [2,3].

2. GENERAL INFORMATION

2.1. DEFINITION AND HISTORY OF 3D PRINTERS

Definition

The phrases additive manufacturing and 3D printing are used interchangeably. Additionally, rapid prototyping , desktop manufacturing or rapid manufacturing, can be used to explain this producing method. [4] 3D printer is a technology that can transform a 3D model drawn by a user in a computer environment into a physical object by converting a file to the required format and sending this file to the printer. [5]

History

3D printer was first produced by Charles Hull in 1984 and the first 3D printer company was founded in 1986. The company launched the first 3D printer, called the SLA-250, in 1988, and discovered Fused Deposition Modeling (FDM) and

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Selective Laser Sintering (SLS) technologies in 1988.

In 1993, color photographs were obtained from these printers for the first time. It started selling 3D printers in 1995. Z Corporation designed the first high resolution 3D printer in 1996. In 2007, the first batch of open-source printer was released under the name Regrap. [2,3]

2.2. USAGE AND PRODUCTION PROCESS OF 3D PRINTING TECHNOLOGY

By the software used in the production of 3D materials, tactile functions that are not found in 2D (two-dimensional printing) printers can be transferred to the products of 3D printers.

For this reason, it is encouraged to be used in many products. Using this technology, accurate anatomical products can be produced and specific patient models can be used in cross-sectional comparison images. For this reason, many products in the field of health were produced using 3D printers and entered the field of health. [6,7]

2.3. WORKING PRINCIPLE OF 3D PRINTERS

Three-dimensional printing technology: It includes 3D printers, modeling software, scanners, and ink (Filament). The three-dimensional model of the object to be printed is created on the computer with the help of a design program or using a scanner. The created model is transferred to the 3D printer as a file. After this stage, it is separated into several layers with a special slicing process. Digital models are turned into objects using three-dimensional ink raw materials called thin layers (filaments). [8,9]

2.4. ADVANTAGES AND DISADVANTAGES OF 3D PRINTERS

2.4.1. Advantages of 3D Printers

Product models prepared with computer aided design can be created in hours or even minutes. Machinery, equipment, and labor costs required for traditional production are reduced. Objects with complex surface geometries can be easily produced. The supply of consumable filaments used is easy and economical, and since most of the consumables are bioplastic, they do not have negative effect on human health. When they are melted, they release toxic gases into the environment and they are also biodegradable. Its cost is very low compared to traditional methods. It can also be used for design research in Engineering education. [10,11]

2.4.2. Disadvantages of 3D Printers

In terms of production time alone, 3D printers are slower in mass production

than other technologies. Surface roughness is a problem in all 3D printers, from the most professional to the most amateur. It is very problematic to produce large parts with 3D writing technology. As the volume grows, the problems mentioned above grow exponentially. [12,13]

2.5. USE OF 3D PRINTERS IN HEALTHCARE

Using these printers, the most common applications are the production of personal surgical and medical equipment, as well as facial, arms, legs and assistive hearing aids and other limb prostheses, implant applications in the field of oral and dental health, and the production of orthodontic brackets. [14,15]

3. 3D PRINTERS IN ORTHODONTICS

The 3D printing method can gain numerous products with high exactness. This technique; It has been used to create removable appliances, dental models, special brackets, retainers, occlusal splints and archwires has been stated in the orthodontic literature. [16,17] Today, the most often use of 3D printers is on the production of the clear aligners. [18]

Virtual impressions are less difficult to keep and may be without difficulty transferred to any laboratory or milling gadget for easier, quicker and more predictable manufacturing. [19]

3.1.MATERIALS USED

Commercial 3D printing materials includeing polycaprolactone (PCL) [typically poly (εcaprolactone)], polypropylene (PP), polylactic acid (PLA), polycarbonate (BPA derivative) (PC), polyglycolic acid (PGA), acrylonitrile butadiene styrene (ABS) have been found. [20] ABS and PLA are the most preferred filaments of 3D printers. In addition, filaments such as PETG, HIPS, PVA, Nylon have also been used. [21]

3.1.1. Polylactic Acid (PLA)

PLA is a synthetic aliphatic polyester. It is biocompatible and biodegradable thermoplastics are derived from renewable resources. [22] PLA is thermally volatile and suggests rapid molecular weight reduction beneath heating. It also tends to be more brittle than different plastics. Moreover, it can be mixed with other polymers to make it usable in many situations. [23]

4. 3D SCANNING AND WRITING IN ORTHODONTICS

In line with the latest developments, the creation of intraoral and facial scan-

ners, digital radiology, and cone-beam computed tomography (CBCT) has improved the effectiveness, consistency, accuracy and predictability of remedy outcomes.The appearance of virtual intraoral impression equipment makes it possible to produce high resolution 3D virtual models. Scanning based on optical principles and technology; eliminated patient discomfort, sensitivity, and laboratory work. [24]

4.1. 3D SCANNERS

One of the important questions to be answered about 3D scanning is how well the digital model obtained reflects the reality. In a study by Alcan et al. using the 3Shape Orthoanalyzer software, they found that the digital model was as reliable as the plaster model and suggested that the digital model would be used as a standard in orthodontic clinics in the future. [25]

4.1.1. Intraoral Scanners

Intraoral scanner devices provide digital warehouse of models in orthodontics. Software developed for casting analysis; It supports many applications such as dental arch length and width measurement, occlusal assessment, and tooth seg- mentation. The digital platform allows clinicians to capture digital diagnostic in- formation, use it in indirect bounding applications, and export digital scan results to open-source file format. [26] The increased reliability and time efficiency of scanners has led to their reputation in clinical use. Published research shows that digital models are comparable and have better accuracy when compared to traditional measurements. [27]

4.1.2. Desktop Scanners

Compared to intraoral scanners, some desktop scanners show higher sensitivity in sharp and undercut areas; however, they showed lower accuracy in areas with interdental spaces (Figure 1). [28]

Figure 1. Desktop Scanner [29]

4.1.3. Face Scanners

Face scanner provide 3D topography for facial anatomy, automatic face recognition, facial symmetry and proportion analysis. [30] Clinical assessment of facial anatomy is subjective, preventing accurate recording of facial organization or changes after following various aesthetic and reconstruction procedures. The innovation in scanning technology provides a valuable method for precise 3D clinical document recording and objective, qualitative and quantitative analysis of human faces.

Although various technologies such as ultrasound, laser scanning, computed tomography, electromagnetic digitization and magnetic resonance imaging can be used to analyze features in three dimensions, stereophotogrammetry systems have become the tool of choice for anthropometric research. [32]

4.2. DIGITAL FLOW CHART

The process will be debated in chronological order:

1. Intraoral Scan
2. Model Manipulation
3. Three Dimension Writing and Rendering
4. Appliance Production

4.2.1. Intraoral Scan

Intraoral scanning makes a topographic map of soft tissues and tooth structure. While the resulting virtual model can be viewed within the scanner software, it should be exported as a standard format language (STL) file for physical purposes (Figure 2).

This universal three-dimension layout represents floor geometry as thousands of related triangles, making it appropriate for CAD software. [32]

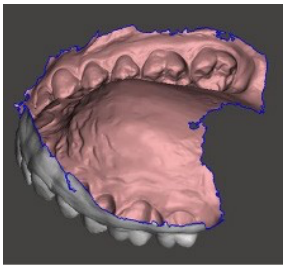

Figure 2. Example of a STL file exported from intraoral scanner software [32]

4.2.2. Model Manipulation

Some model manipulation softwares can be used to base virtual models and make them robust (Figure 3) [32]. This is especially beneficial if we are aiming to make orthodontic aligners because base is prepared and cut only once, in which case this base is copied for all aligner models. That is accompanied with the aid of teeth segmentation, attachment additions, teeth movements, and treatment collection prior to aligner model printing. [34]

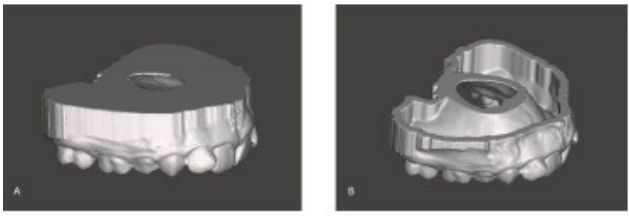

Figure 3. Digital images of the same maxillary STL file arch model with (A) a solid base and (B) a hollow base. [33]

4.2.3. Three Dimension Writing and Rendering

These fluctuate contingent upon the sap utilized, so the printer producer's suggestions ought to be followed with respect to the accompanying two completing advances:

a) Model wash: After printing, models are normally washed in isopropyl liquor (IPA) with a convergence of at minimum 95% for 10 minutes to eliminate lingering surface tar. Models should then be air-dried or blow-dried to eliminate any IPA buildup.

b) Model restoring: Many printer producers sell relieving boxes that will dependably set the model surface inside 30 minutes. The models are then prepared for utilize and can be utilized without gloves at this stage. [35]

4.2.4. Appliance Production

This progression recreates conventional procedures for assembling both orthodontic retainers and aligners, in which a vacuum or tension shaping machine is utilized to frame the thermoplastic material around the model (Figure 4). [36]

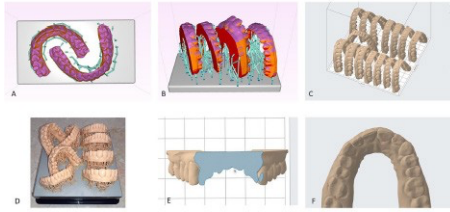

Figure 4. PC outlines of computerized model control in 3D printer programming. [36]

5. THREE-DIMENSIONAL DESIGN AND MANUFACTURINGOF ORTDONTIC DEVICES

5.1. DIAGNOSTIC MODEL GENERATION WITH 3D PRINTER

Models assume a significant part in clinical and logical examination in orthodontics, for example, determination, formation of treatment plans, creation of exceptional orthodontic apparatuses and assessment of treatment impacts. [37] Compared to customary mortar models, the benefits of computerized models away, access, transportation and investigation are huge. Simultaneously, many examinations support the precision of computerized models and backing that there is no critical contrast from conventional mortar models. [38,39]

5.2. PRODUCTION OF CLEAR ALIGNER WITH 3D PRINTER

The conventional aligner manufacture process depends on getting a dental im- pression from the patient on mortar models and afterward thermoforming a bio- compatible thermoplastic clear sheet utilizing a vacuum thermoforming machine.[40] Geometric mistakes are normal in its produce and generally happen during impression taking and thermoforming of the aligner; these blunders can be limited utilizing 3D displaying innovation.

To additionally diminish these mistakes, any halfway advances that produce blunders can be dispensed with if a straightforward biocompatible aligner can be straightforwardly 3D printed for patients to utilize. It additionally offers the chance to save time and exertion by printing the aligner straightforwardly. Until now, there are restricted examinations looking at the mechanical and mathematical properties between 3D printing and thermoformed aligners. Be that as it may, manual control of help structures is regularly needed to empower improvement of the 3D printing process. Support structures are significant since, in such a case that the parts are not enough upheld, the part might neglect to print or create a model with numerous wrong elements (Figure 5 and 6).

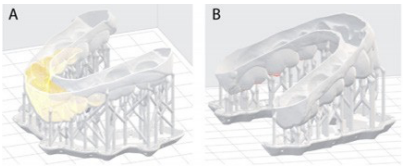

Figure 5. Aligner design and placement of support structures in PreForm software [41]

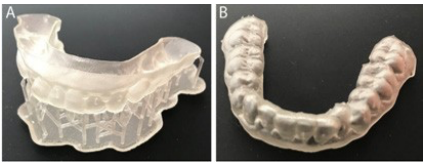

Figure 6. A, pressed and cured dental aligner; B, Removal of support structures from the aligner [41]

Direct 3D printing of aligners, the construction of their splints offers several advantages:

- Borders are carefully planned and repeated indistinguishably for all aligner sets,
- Edges are smooth and require no managing or cleaning,
- Undercut isn't accessible as they are characterized carefully,
- Aligners are delivered with more noteworthy accuracy, as there are no blunders presented during the printing of the 3D trim model and during the thermoforming period of creation,
- Gives higher affectability, better fit and higher proficiency.

5.3. RETAINER PRODUCTION WITH 3D PRINTER

While the high precision of composed dental models is an incredible improvement in the progression of dental 3D printing, the main use of 3D imprinting in the field of orthodontics is the straightforwardly printed essix retainer (Figure 7). The patient's oral cavity can be digitally scanned without a physical model for direct printing of plates such as retainer plates or clear plates.

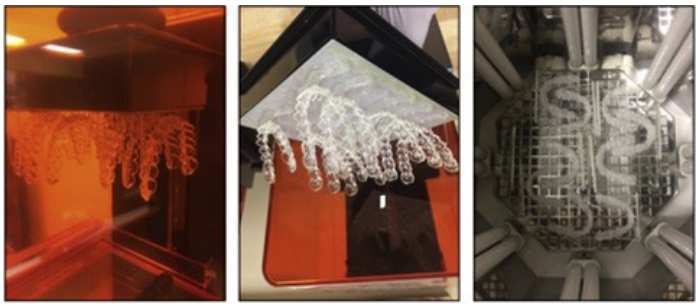

Figure 7. 3D retainer manufacturing steps [41]

5.4. NASOALVEOLAR MOLD PRODUCTION WITH 3DPRINTER

For a situation report distributed by Zheng et al. [43], it was expressed that a patient with neonatal one-sided congenital fissure sense of taste was treated with nasolabial morphology and forming of the alveolar curve utilizing 3D printing of the Presurgical Nasoalveolar Molding (PNAM) machine (Figure 8-12). 3D printing of pre-careful split-type nasoalveolar shaping assisted with decreasing parted space, work on curve structure, rough lip fragments, and altogether work on nasal morphology by revising leveled nasal wings.

Figure 8. Extraoral accounts before PNAM treatment. Pictures show 8-day-old child kid with congenital fissure, alveolus, and sense of taste [43]

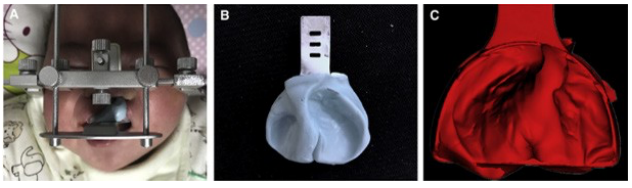

Figure 9. Impression and filtering. A, Articulator was utilized to move the Frankfort plane. B, impression taken with silicone. C, Impression filter [43]

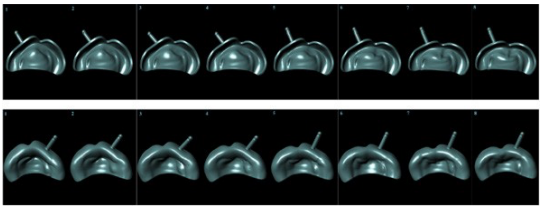

Figure 10. Design procedure of CAD forming plate divided to eight steps with selective removal and sequential addition of resin [43]

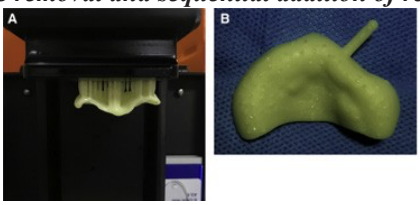

Figure 11. Stereolithographic print of the framing plate. A, the framing plate imprinted on the stage printer. B, in the wake of managing, evacuation of help designs and disinfection via autoclave. [43]

Figure 12. Appearance of the cleft space at the end of PNAM treatment [43]

5.5. PRODUCTION OF MINI IMPLANT SUPPORTED APPLIANCES WITH 3D PRINTER

The introduction of intraoral scanning equipment has enabled intraoral scanning of implants to be performed with high precision. [44] Scan bodies (similar to print heads) on micro-implants can be used to increase the sensitivity of scan results or directly scan micro-implants depending on the accuracy of intraoral scanning equipment. Once the scan is successful, clinicians and lab technicians can jointly design customized devices based on individual treatment goals and the biomechanical plan the patient needs. Mini-implants have received a lot of attention in recent years as they are less invasive, cost-effective, and clinically easy to use. As of late, extension machines have been fostered that utilization palatal smaller than normal embeds and limit the powers put on the teeth. Embed helped quick palatal extension was created to amplify skeletal development and limit

dental incidental effects. [45,46]

Computer supported design/computer aided manufacturing (CAD/CAM) system for the manufacture of 3D metal-printed orthodontic appliances is a proficient and exact strategy for creating palatal smaller than usual embed upheld apparatuses. The advantages for the patient are less clinical arrangements and more noteworthy comfort during the output enlistment process.

5.6. REMOVABLE APPLIANCE PRODUCTION WITH 3D PRINTER

The CAD/CAM system and added substance producing frameworks have been effectively presented in the field of removable appliances utilized in orthodontics. In the literature, the andresen appliance (monoblock) [47] has been used to create a sleep apnea appliance with 4 pivoting hinges in a single structure, just as three-dimensional printing is used to create and deploy a vestibule arch. [48]

Wiechmann et al. [49] recently utilized this PC based innovation to pivot the connectors of the Herbst machine onto custom lingual sections, the creators of a later report utilized this strategy to manufacture the computerized titanium Herbst apparatus. [50] Moreover, the Hawley appliance designed in this study provided the explanation of how to design and manufacture an orthodontic clasp without a tooth model using only intraoral scans in principle (Figure 13). [51]

Figure 13. 3D printed hawley appliance [51]

5.7. PRODUCTION OF EXPANSION APPLIANCES WITH A 3DPRINTER

Graf et al. utilized a CAD/CAM program to make Hyrax appliances for maxillary expansion for 3 patients without actual impressions or printed models. Work process: intraoral examining, computerized plan of pre-assembled expansion screws, 3D metal printing directly by laser melting, expansion screw brazing, insertion into the patient's mouth and final activation. [52]

In the first place, computerized impressions of the two jaws and occlusal

conclusion was taken utilizing an intraoral scanner (Trios Pod Version; 3Shape, Copenhagen, Denmark). Subsequent to filtering, the advanced model was looked at over the shading picture on the scanner screen. Next, the direct download link was used to send the digital impression to the technician and was sent to the technician.

Hyrax was planned by a lab technician utilizing the 3Shape Appliance Designer programming (Figure 14). To accomplish an all-advanced strategy, customary molar groups must be supplanted by printed cuts: the clasps were set around the molar teeth and reached out on the palatal side up to the essential canines, yet without entering the interdental spaces. The surfaces covering the teeth are planned as extensive as conceivable to give better maintenance of the machine. Then again, little snares are planned on the sides of the molars and on the sense of taste of the essential first molars to work with decimantation of the appliance.

The final digital form is then shipped off the laser melting (printing) machine. [53] After the laser is melted, it is polished with electropolishing and then the expansion screw is soldered to the prepared area. Then the surface to be bonded is sandblasted (Figure 15).

Figure 14. Digital design of the Hayrax appliance, using pressed crochets instead of molar tape [52]

Figure 15. 3D printed hayrx appliance [52]

This technique can eliminate all the shortcomings of conventional impressions: vomiting reflexes, patient discomfort, and deformation of the impression material (such as dimensional changes and air bubbles during pouring). Another

benefit is that for traditional molar bands, for example, the printed hyrax bands are designed to digitally surround the molars. Thus, one visit is reduced and there is no need to print physical study models. Also, if the appliance breaks, there is no need for a new size or model, as a copy from the digital archive will suffice.

5.8. 3D AIDED INDRECT BONDING

With the help of commercially available software, we can place the bracket on the 3D model and use tools to help position the bracket in the most accurate way (Figure 16-18). Some of the software on the market provides the option to view the aligned brackets and teeth using a full size wire and gives the clinician an indication of the 3D results once the teeth are aligned with the selected bracket location. Clinicians can then virtually change the position of the bracket and improve predicted outcomes. [54]

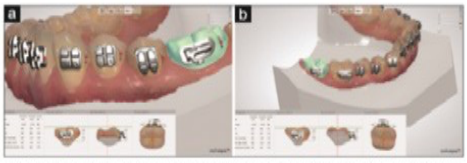

Figure 16. Indirect bonding with Orthoanalyzer [54]

After verifying the position of the bracket, the carrier plate can be produced. This can be achieved in a variety of ways; A 3D-printed model can be made using a virtually positioned bracket and a carrier plate can be made on the model. The model is made by eliminating the hooks of the bracket and the undercuts on the model so that the bracket can be attached to the carrier plate. The lab or clinician can then place the bracket on the carrier plate prior to the bonding step. [54]

Figure 17. Models used for indirect bonding were produced with a Formlab 2 SLA 3D printer [54]

The traditional use of a bracket placement has viewed the long axis of the dental clinical crown as a guide for bracket placement, as determined by the straight-wire technique. [55] However, considering the root, it has been reported to

differ from the true long axis of the tooth. [56,57] The ability to align teeth, considering both the crown and root of the tooth, improves treatment outcome and reduces the likelihood of post-treatment recurrence.

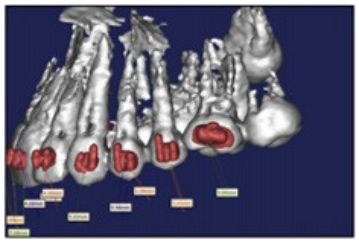

Figure 18. Placement of brackets according to the roots of the teeth [54]

However, exposing orthodontic patients to CBCT for the benefits of computer-aided manufacturing will increase the patient's radiation dose and ultimately cause harm. [58]

5.9. 3D AIDED SURGICAL PLANNING AND SURGICAL SPLINT PRODUCTION

Utilizing 3D composing innovation, tooth developments and skeletal parts can be anticipated and reenacted and converted into actual cycles through custom creation of machines. This technique gives a few remarkable benefits to treatment arranging and the executives. [58] These developments can't be recorded at the foundation of the skull and in this way their relationship to the face must be assessed from radiographs and photos.

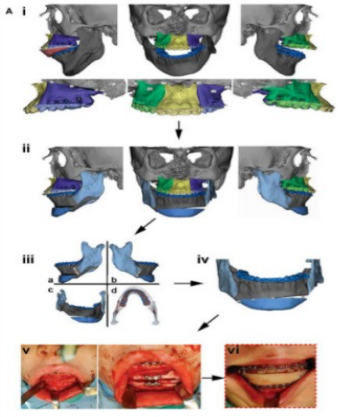

Figure 19. Virtual analysis and treatment arranging in orthodontics and orthognathic surgery [58]

Performing surgery before appropriate orthodontic correction can accelerate tooth movement by providing a positive biological effect, thereby greatly shortening the treatment time, but this is difficult because the final position of the mandible and the relationship between the teeth must be predicted. Custom manufacture of surgical splints and stainless-steel arches with 3D advanced treatment recreation permits exact and concurrent preparation and execution of both dentaland skeletal developments. [59]

CONCLUSION

3D desing and manufacture technologies are becoming more and more common in many areas of our lives. With the rapid development of technology and the innovations brought by those technologies, our lives are getting easier and we have to keep up with the speed of technologies. 3D imaging, modeling and CAD technologies play a major role in all areas of dentistry. Digital dentistry has brought many advantages to both patients and physicians. In our changing world, thanks to digital dentistry, patient-specific models and appliances are produced with accuracy, while the patient's stay in the chair is shortened.

There is extraordinary potential for 3D printing applications in clinical dentistry and maybe most clearly orthodontics. While this includes the transition from traditional methods to an all-digital workflow, it is expected that this technology will not stop and evolve further for orthodontic uses, especially in specializing in software and different physical processes. Given the right arrangement and printing steps are followed, 3D printing produces precise and vigorous dental models without the disarray and blunders related with customary dental impressions and mortar models. It has additionally dispensed with, as a rule, issues like the position of a detachment elastics and rehashed arrangements for retainer impressions.

3D technologies have been used in orthodontics to produce clear aligners, removable appliances, dental models, special brackets, retainers, surgical splints and archwires. While the 3D design and production of many orthodontic devices are becoming so common, new developments should be followed with interest and scientific studies in this field should be increased.

REFERENCES

1. Aydın L, Küçük S. Üç boyutlu yazıcı-tarayıcı ile hastaya özel medikal ortez tasarımı ve geliştirilmesi. Journal of Polytechnic, 20 (1), 1-8, 2017.

2. Shellabear, M., Lenz, J., and Junior, V., "E-manufacturing with Laser Sintering—to Series Production and Beyond, in: Proceedings of the Fourth Laser Assisted Net Shape Engineering", (2004), vol. 1, September, Erlangen, Germany, pp. 435–444.
3. Alcisto, J., Enriquez, A., Garcia, H., Hinkson, S., Steelman, T., Silverman, E., Valdovino, P., Gigerenzer, H., Foyos, J., Ogren, J., Dorey, J., Karg, K., McDonald, T., and Es-Said, O. S., (2011) "Tensile Properties and Microstructures of Laser-Formed Ti-6Al-4V", JMEP, 20(2), p 203–212.
4. Dodziuk, H. (2016). Applications of 3D printing in healthcare. Kardiochirurgia i torakochirurgia polska= Polish journal of cardio-thoracic surgery, 13(3), 283-293.
5. Barnatt, (2016). 3D printing. Printed and bound on demand.
6. Malik H, Darwood R, Shaunak S, Kulatilake P, Abdulrahman A, Mulki O, Baskaradas A. Three-dimensional printing in surgery: A review of current surgical applications. J Surgic Res, 199(2), 512-522, 2015.
7. Cantinoti M, Valverde I, Kuty S. Three-dimensional printed models in congenital heart disease. Int J Cardiovasc Imaging, 33 (1), 137-144, 2017.
8. Giannatsis, J., and Dedoussis, V. (2009). "Additive Fabrication Technologies Applied To Medicine And Health Care: A Review", Int. J. Adv. Manuf. Technol., 40, 116-127.
9. Çelik, İ., Karakoç, F., Çakır, M. C., and Duysak, A. (2013). "Hızlı Prototipleme Teknolojileri ve Uygulama Alanları". Dumlupınar Üniversitesi Fen Bilimleri Enstitüsü Dergisi, 31, 53-69.
10. Kuzu Demir, E. B., Çaka, C., Tuğtekin, U., Demir, K., İslamoğlu, H., and Kuzu, A. (2016) "Üç Boyutlu Yazdırma Teknolojilerinin Eğitim Alanında Kullanımı", Türkiye'deki Uygulamalar Ege Eğitim Dergisi. (17) 2: 481 – 503.
11. Lipson, H., and Kurman, M. (2013) "Fabricated: The New World of 3D Printing". Indianapolis, IN: John Wiley & Sons, Inc.
12. Kuzu Demir, E. B., Çaka, C., Tuğtekin, U., Demir, K., İslamoğlu, H., and Kuzu, A. (2016) "Üç Boyutlu Yazdırma Teknolojilerinin Eğitim Alanında Kullanımı", Türkiye'deki Uygulamalar Ege Eğitim Dergisi. (17) 2: 481 – 503.

13. Lipson, H., and Kurman, M. (2013) “Fabricated: The New World of 3D Printing”. Indianapolis, IN: John Wiley & Sons, Inc.
14. Demir K, Çaka C, Tugtekin U, Demir K, Islamoğlu H, Kuzu A. 3D yazdırma teknolojilerinin eğitim alanında kullanımı: Türkiye’deki uygulamalar. Ege Eğitim Dergisi, 17 (2), 481-503, 2016.
15. Lioufas A, Quayle R, Leong C, McMenamin G. Three dimensioanl printed models of cleft palate pathology for surgical education. Plast Reconstr Surg Glob Open, 4 (9), 1-6, 2016.
16. Hazeveld, A., J.J.H. Slater, and Y. Ren, Accuracy and reproducibility of dental replica models reconstructed by different rapid prototyping techniques. American Journal of Orthodontics and Dentofacial Orthopedics, 2014. 145(1): p. 108-115.
17. Nasef, A.A., A.R. El-Beialy, and Y.A. Mostafa, Virtual techniques for designing and fabricating a retainer. American journal of orthodontics and dentofacial orthopedics, 2014. 146(3): p. 394-398.
18. Wiechmann, D., et al., Customized brackets and archwires for lingual orthodontic treatment. American journal of orthodontics and dentofacial orthopedics, 2003. 124(5): p. 593-599.
19. Wiechmann, D., R. Schwestka-Polly, and A. Hohoff, Herbst appliance in lingual orthodontics. American Journal of Orthodontics and Dentofacial Orthopedics, 2008. 134(3): p. 439-446.
20. Ligon, S. C.; Liska, R.; Stampfl, J.; Gurr, M.; Mulhaupt, R., Polymers for 3D Printing and Customized Additive Manufacturing. Chem. Rev. 2017, 117, (15), 10212-10290
21. Szymon Wojtyła, Piotr Klama & Tomasz Baran (2017) Is 3D printing safe? Analysis of the thermal treatment of thermoplastics: ABS, PLA, PET, and nylon, Journal of Occupational and Environmental Hygiene, 14:6, D80-D85.
22. Jamshidian, M., E. A. Tehrany, M. Imran, M. Jacquot, and S. Desobry: Poly-lactic acid: Production, applications, nanocomposites, and release studies. Compr. Rev. Food Sci. Food Saf. 9:552–571 (2010).
23. Szymon Wojtyła, Piotr Klama & Tomasz Baran (2017) Is 3D printing safe? Analysis of the thermal treatment of thermoplastics: ABS, PLA, PET, and nylon, Journal of Occupational and Environmental Hygiene, 14:6, D80-D85
24. Tejaswi, A., et al., Efficient use of cloud computing in medical science. American journal of computational mathematics, 2012. 2(3): p. 240-243.

25. Alcan T, Ceylanoglu C, Baysal B: The relationship between digital model accuracy and time dependent deformation of alginate impressions. Angle Orthod 2009; 79: 40-6.
26. Logozzo, S., et al., Recent advances in dental optics–Part I: 3D intraoral scanners for restorative dentistry. Optics and Lasers in Engineering, 2014. 54: p. 203-221.
27. Flügge, T.V., et al., Precision of intraoral digital dental impressions with iTero and extraoral digitization with the iTero and a model scanner. American Journal of Orthodontics and Dentofacial Orthopedics, 2013. 144(3): p. 471-478.
28. Flügge, T.V., et al., Precision of intraoral digital dental impressions with iTero and extraoral digitization with the iTero and a model scanner. American Journal of Orthodontics and Dentofacial Orthopedics, 2013. 144(3): p. 471-478.
29. Correia, G.D.C., F.A.L. Habib, and C.J. Vogel, Tooth-size discrepancy: A comparison between manual and digital methods. Dental press journal of orthodontics, 2014. 19(4): p. 107-113
30. Zhurov, A.I., et al., Averaging facial images. Threedimensional imaging for orthodontics and maxillofacial surgery. London: Wiley-Blackwell, 2010: p. 126-44.
31. Jacobs, R.A. and P.S.E.F.D. Committee, Three-dimensional photography. Plastic and reconstructive surgery, 2001. 107(1): p. 276-277.
32. Brown GB, Currier GF, Kadioglu O and Kierl JP (2018) Accuracy of 3-dimensional printed dental models reconstructed from digital intraoral impressions. American Journal of Orthodontics and Dentofacial Orthopedics 154: 733–739.
33. https://www.3shape.com/en/ software / ortho-system; erişim tarihi 20 Nisan 2020
34. Jindal P, Juneja M, Siena FL, Bajaj D and Breedon P (2019) Mechanical and geometric properties of thermoformed and 3D printed clear dental aligners. American Journal of Orthodontics and Dentofacial Orthopedics 156: 694–701.
35. Hull CW, UVP Inc. (1986) Apparatus for Production of Three-Dimensional Objects by Stereolithography. US Pat 4575330.
36. Hazeveld A, Huddleston Slater JJ and Ren Y (2014) Accuracy and reproducibility of dental replica models reconstructed by different rapid prototyping techniques. American Journal of Orthodontics and Dentofacial Orthopedics 145: 108–115.

37. Keating AP, Knox J, Bibb R, Zhurov AI (2008) A comparison of plaster, digital and reconstructed study model accuracy. J Orthod 35(3):191–201 (discussion 175)
38. Czarnota J, Hey J, Fuhrmann R (2016) Measurements using orthodontic analysis software ondigital models obtained by 3D scans of plaster casts : Intrarater reliability and validity. J Orofac Orthop 77(1):22–30
39. Sousa MV, Vasconcelos EC, Janson G, Garib D, Pinzan A (2012) Accuracy and reproducibility of 3-dimensional digital model measurements. Am J Orthod Dentofacial Orthop 142(2):269–273
40. Malik O, McMullin A, Waring D. Invisible orthodontics part 1. Invisalign 2013: 203-4, 207-10, 213-215.
41. Formlabs. Form wash and form cure tech specs; 2017. Available at: https://formlabs.com/tools/wash-cure/tech-specs. Accessed February 18, 2019.
42. Cole, D., Bencharit, S., Carrico, C., Arias, A. and Tüfekçi, E., 2019. Evaluation of fit for 3D-printed retainers compared with thermoform retainers. American Journal of Orthodontics and Dentofacial Orthopedics, 155(4), pp.592-599.
43. Zheng, J., He, H., Kuang, W., & Yuan, W. (2019). Presurgical nasoalveolar molding with 3D printing for a patient with unilateral cleft lip, alveolus, and palate. American Journal of Orthodontics and Dentofacial Orthopedics, 156(3), 412-419.
44. Aragon ML, Pontes LF, Bichara LM, Flores-Mir C, Normando D. Validity and reliability of intraoral scanners compared to conventional gypsum models measurements: a systematic review. Eur J Orthod 2016;38:429-34.
45. Wilmes B, Nienkemper M, Drescher D. Application and effectiveness of a mini-implant- and tooth-borne rapid palatal expansion device: the hybrid hyrax. World J Orthod 2010;11:323-30.
46. MacGinnis M, Chu H, Youssef G, Wu KW, Machado AW, Moon W. The effects of micro-implant assisted rapid palatal expansion (MARPE) on the nasomaxillary complex—a finite element method (FEM) analysis. Prog Orthod 2014;15:52
47. Sassani F, Roberts S. Computer-assisted fabrication of removable appliances. Comput Industry 1996;29:179-95.
48. Abe Y, Maki K. Possibilities and limitation of CAD/CAM based orthodontic treatment. International Congress Series 2005; 1281:1416.
49. Wiechmann D, Schwestka-Polly R, Hohoff A. Herbst appliance in lingu-

al orthodontics. Am J Orthod Dentofacial Orthop 2008;134: 429-46.
50. Farronato G, Santamaria G, Cressoni P, Falzone D, Colombo M. The digital-titanium Herbst. J Clin Orthod 2011;45:263-7.
51. Al Mortadi, N., Jones, Q., Eggbeer, D., Lewis, J. and Williams, R., 2015. Fabrication of a resin appliance with alloy components using digital technology without an analog impression. American Journal of Orthodontics and Dentofacial Orthopedics, 148(5), pp.862-867.
52. Graf, S., Cornelis, M., Hauber Gameiro, G. and Cattaneo, P., 2017. Computer-aided design and manufacture of hyrax devices: Can we really go digital?. American Journal of Orthodontics and Dentofacial Orthopedics, 152(6), pp.870-874.
53. Wataha JC, Messer RL. Casting alloys. Dent Clin North Am 2004;48: vi-viii, 499-512.
54. Christensen, L., 2017. Digital workflows in contemporary orthodontics. APOS Trends in Orthodontics, 7, pp.12-18.
55. Andrews F. The six keys to normal occlusion. Am J Orthod 1972; 62:296-309.
56. Bryant RM, Sadowsky PL, Hazelrig JB. Variability in three morphologic features of the permanent maxillary central incisor. Am J Orthod 1984;86:25-32.
57. Carlsson R, Ronnerman A. Crown-root angles of upper central in- € cisors. Am J Orthod 1973;64:147-54.
58. Janakiraman N, Feinberg M, Vishwanath M, et al. Integration of 3- dimensional surgical and orthodontic technologies with orthognathic "surgery- first" approach in the management of unilateral condylar hyperplasia. Am J Orthod Dentofacial Orthop. 2015;148:1054-1066.
59. Uribe F, Janakiraman N, Shafer D, Nanda R. Three- dimensional cone-beam computed tomography- based virtual treatment planning and fabrication of a surgical splint for asymmetric patients: surgery first approach. Am J Orthod Dentofacial Orthop. 2013;144: 748-758.

RNA Viruses in Honey Bees

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RNA VIRUSES IN HONEY BEES

Honey bees are one of the most important insect groups of great agricultural importance (1, 2). However, there are many pathogenic microorganisms that cause illness the worker bees, who do all the work of the hive and produce bee products, and the queen bee, who maintain the order in the hive (3). One of the most important factors in the spread of these diseases is migratory beekeeping (4, 5). Viral pathogens are the leading cause of disease and death of bees in various developmental stages (larva, pupa, adult) (6). While some of the viral pathogens continue to exist silently without causing serious diseases, some of them cause significant diseases, death, and even colony extinction in individuals (7). In addition, as a result of mixed infection, it is possible for some individuals to be infected with more than one virus at the same time (8, 9).

The determination of viral diseases in honey bees is generally done by classical molecular methods. The presence of the virus is detected by RNA isolation from individuals who are determined to be morphologically sick and real-time PCR using specific primers (6). However, new generation sequencing studies, which have become widespread in recent years, have allowed the discovery of new viruses. Thus, the presence of asymptomatic viruses is revealed by metagenome and transcriptome analysis. This technology enables the identification of new virus species and strains with high accuracy without the need for processes such as purification and culturing of viruses (10).

Until now, it has been determined that there are more than 30 viruses that cause infection in honey bees using both classical molecular methods and new generation sequencing methods (11-13). However, in this chapter, seven honeybee viruses (14-17) that cause very serious diseases and colony collapses around the world and threaten the world beekeeping to a great extent are discussed. General information about these viruses is given in Table 1.

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Table 1. General information of the most common honey bees viruses

Virus name	Nükleik asit	Family	Genus	Genome size	ORF number	Origin country of genome analysis	Accession number of references genome	References
Acute bee paralysis virus	ssRNA	Dicistroviridae	Aparavirus	~ 9.5 kb	2	UK	NC_002548	(18)
Israeli acute paralysis virus	ssRNA	Dicistroviridae	Aparavirus	~ 9.5 kb	2	Israel	NC_009025	(19)
Kashmir bee virus	ssRNA	Dicistroviridae	Aparavirus	~ 9.5 kb	2	USA	NC_004807	(20)
Black queen cell virus	ssRNA	Dicistroviridae	Triatovirus	~ 9.5 kb	2	South African	NC_003784	(21)
Deformed wing virus	ssRNA	Iflaviridae	Iflavirus	~ 10 kb	1	Italy	NC_004830.2	(22)
Sacbrood virus	ssRNA	Iflaviridae	Iflavirus	~ 9 kb	1	UK	NC_002066.1	(23)
Chronic bee paralysis virus	ssRNA	unclassified	unclassified	~2.3kb	4	France	NC_010712.1	(24)
				~3.7kb	3		NC_010711.1	

DICISTROVIRIDAE

Dicistroviruses are positive-stranded RNA viruses that infect invertebrates. There are two open reading chains (polymerase polyprotein and structural polyprotein) in their genomes (25). There are four virus species in this family that infect honey bees. In these species, three of them are in the genus Aparavirus [Acute bee paralysis virus (ABPV), Israeli acute paralysis virus (IAPV), Kashmir bee virus (KBV)], and one is in the genus Triatovirus [Black queen cell virus (BQCV)] (6, 26).

Acute bee paralysis virus (ABPV)

ABPV causes paralysis in honey bees. This situation is often confused with the drug poisoning of honey bees. However, while bees die in a very short time in case of poisoning, in ABPV infection, it takes four days for the virus to multiply in the body and its symptoms appear (27). In infected bees, there is constant shaking of the legs and wings and complete disintegration of the wings in the following process (5). In addition, darkening of the hair on the thorax and abdomen and hair loss occurs in infected individuals (19, 28, 29). Although ABPV infects honey bees in all stages, obvious symptoms may not be seen in adults. However, infected adult bees feed the young larvae and transfer the virus particles to them nutritionally. This has been determined as the accumulation of virus particles in the brains and pharynx glands of young larvae and scattering with their feces (28, 30-32). Although ABPV does not show any symptoms in males, it allows the transmission of the virus to the female individual during mating and the transmission of the virus to the offspring with vertical spread (33). The most suitable life stage for the proliferation of the virus is the pupal stage (16, 34). The most effective method recommended for the control of this disease is to carry out breeding studies. Thus, disease-resistant colonies should be obtained (5).

Israel acute bee paralysis virus (IAPV)

Although IAPV and ABPV cause similar diseases such as paralysis and loss of abdominal feathers in bees, they differ serologically (19). The characteristic feature seen in honey bee individuals infected with IAPV is that the individuals are found dead outside the hive (35). In particular, it is in question that fieldworker bees leave the hive for flight and do not return (36). However, in addition to IAPV infection, it is common for individuals to be infected simultaneously with other viral pathogens and/or parasites. This situation results in sudden colony collapse and almost all individuals leaving the hive (7,37-39).

Kashmir bee virus (KBV)

KBV is genetically, serologically, and pathologically similar to ABPV (40). KBV is the virus with the highest mortality rate among the honeybee viruses (41). The virus, which multiplies rapidly in the body, can cause the death of individuals in as little as three days (19). KBV can infect all life stages of bees. The ways in which the virus is transmitted from one individual to another are quite diverse. The virus can be taken into the body by the digestive tract, or it has the feature of creating infection bypassing the cuticle by direct contact between bees (41, 42). In addition, the detection of KBV RNA in queen bees and eggs indicates that the virus can also be transmitted transovarially (43). However, the detection of KBV in honey, pollen royal jelly, and feces indicate that the virus can be transmitted through contaminated food sources in the colony (28, 44, 45). Individuals who are sick often appear to tremble, become uncoordinated, or die around the hive. It is observed that the body becomes hairless and oily in mature individuals infected with KBV, and the body becomes transparent in young individuals (46).

Black queen cell virus (BQCV)

BQCV is frequently seen in queen-rearing colonies, especially in spring (47). The virus causes queen bees, which have a black color in the honeycomb eyes in the hive. In addition, it causes a very high infection in the larva and pupa stages of honey bees. While the infected larvae are initially yellow in color and soft-bodied, as the virus multiplies in the body, its body becomes black and death occurs at a high rate (48). Transmission of the virus usually occurs during feeding (41). Young worker bees transmit the virus to healthy larvae by horizontal route during feeding (44). In addition, the developing queen bee can infect the larvae and pupae with viruses (47). Thus, the infection can be transferred from the queen bee to the offspring (44). The agent multiplies rapidly in the pupae and the pupa turns dark and dies. Worker bees can also be infected with this virus, but usually do not show symptoms (42).

IFLAVIRIDAE

Iflaviruses are positive-stranded RNA viruses that cause infection in invertebrates (49). There is a large open reading chain (polyprotein) in their genomes (50). This family has a single genus called Iflavirus. There are two types of viruses [Deformed wing virus (DWV), and Sacbrood virus (SBV)] that cause disease in honey bees (49, 51).

Deformed wing virus (DWV)

DWV is the most common viral pathogen in honey bees worldwide (52). The incidence of viral infection varies seasonally. DWV infection especially in adults and pupae increases from summer to autumn (47). Deformation, i.e. wrinkling, on the wings of adult individuals infected with this virus is the characteristic feature of the disease. This situation of wings is evident from the pupal stage. Circulatory, digestive, and excretory system disorders are observed in individuals who cannot use their wings properly due to these deformations in the wings (22, 53, 54). In addition, body shrinkage and translucency can be observed in infected individuals (42). Young bees infected with DWV cannot come to their senses for a long time after they come out of their brood eyes, cannot get rid of their wet, dull gray, pale appearance, and cannot move like normal bees (22, 53, 54).

Kakugo virus (KV), which shows 97-98% homology with DWV and is thus classified as the DWV-A genotype, causes infection in the brains of honey bees (55). Although KV and DWV are highly similar, the pathogenicity and infection symptoms they cause in honey bees are quite different (56). KV is located in brain regions that process honeybee sensory experiences and coordinate behavior (57). This virus causes aggressive behavior in bees (15).

Sacbrood virus (SBV)

SBV infection is frequently observed in the spring and summer months when nectar flow and brood production increase (47). Detection of SBV virus in pollen indicates that the virus is likely to be transmitted to the colony through food (45). The virus settles in the hypopharyngeal glands of the bees and causes disturbances in the molting pattern. Especially the larval stage is very sensitive to SBV infection. Infected larvae have difficulty in passing into the pupal stage and die. Dead larvae dry up, their body turns black, and their heads turn sideways (3, 58, 59). Worker bees remove the dead larvae from the cells of the comb and throw them out, and clean the cells of the comb where the dead larvae are located. During this process, infection is easily transmitted to worker bees (60). Although bees become less susceptible to infection as they get older, they have a silent/hidden infection. This situation leads to a decrease in the life span of adult bees and a decrease in pollen-collecting power (5).

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Chronic bee paralysis virus (CBPV)

CBPV is transmitted orally to adult honey bees and shows symptoms similar to ABPV infection. Although the symptoms of paralysis, tremor, and hairless

abdomen in bee individuals are quite similar to ABPV, the virulence of CBPV is lower (24). Infection symptoms caused by CBPV in adults are divided into two groups. The first symptom of infection is the inability of adult bees to fly and crawl due to excessive shaking of their wings. Another sign of infection is the reduction of body hair in individuals infected with CBPV. When infected individuals with low hair enter the hive, aggressive behavior is observed in healthy individuals (53, 61). The fact that CBPV shows two different signs of infection even in the same hive is entirely due to genetic differences between individuals (62, 63). The increase in population density in the hive and excessive individual contacts between healthy and infected individuals cause an increase in the death rate (63).

MODERN MOLECULAR APPROACHES USED IN THE CONTROL OF HONEYBEE VIRUSES

RNA interference (RNAi) technology is a special method used to silence specific genes and has been widely used in many areas in recent years. First discovered in plants in the 1990s, RNAi was discovered in mammals in the early 2000s (64-66). The mechanism of RNAi is briefly explained as double-stranded RNA when it enters the cell, causing fragmentation of the complementary mRNA sequence, thus post-transcriptional gene silencing (67). In addition, RNAi's biological function in living organisms protects the genome against the invasion of mobile genetic elements such as virus inheritance material and transposons and provides cellular defense. One of the most important advantages of RNAi technology is its role in gene regulation with post-transcriptional gene silencing, which is important for the function of developmental programs of eukaryotic organisms (68-71).

The vast majority of viruses that cause infection in honey bees have a positive RNA genome. For this reason, the use of RNAi technology in the protection of honey bees against viruses is very promising and RNAi is expected to be an important defense mechanism against viruses in honey bees. In this mechanism, which has a completely natural process, the process begins with enzymes belonging to the RNAse III ribonuclease family. Similar to the DICER enzyme found in *Drosophila*, the enzyme produced by the DICER-like gene in bees has the feature of dsRNase, and it converts double-stranded RNAs into small interfering RNA (siRNA) (72,73). Thus, dsRNAs are now present in the cell as small inhibitory RNA (siRNA) (74, 75). Thus, the resulting endonuclease activities and RNA Induced Silencing Complex (RISC) prevent the replication of RNA viruses that cause infection in honey bees (76-78).

Studies using RNAi technology against important RNA viruses that cause disease in honey bees have gained momentum in recent years. Numerous RNAi

studies have been conducted to protect the embryos (79, 80), larvae (81, 82), pupae (83, 84), and adults (85, 86) of virus-infected honey bees from the virus. Some of these studies are as follows: In a study conducted in bees infected with IAPV, special siRNAs were developed that target the internal ribosomal entry site (IRES) of the virus, which is required for protein translation, and thus the virus level in infected bees was found to decrease (87). Although this study was specific to IAPV species, another study showed a decrease in wing deformation and mortality of larvae and adult bees in bees infected with DWV by creating a general siRNA (88). Ensuring that bees develop a general dsRNA-mediated antiviral response from virus strain-specific application of RNAi technology will protect bees against all families of RNA viruses infecting bees. RNAi technology holds promise as the most important molecular approach developed to date to combat honeybee viruses.

References

1. Evans E, Smart M, Cariveau D, Spivak M. Wild, native bees and managed honey bees benefit from similar agricultural land uses. Agriculture, Ecosystems & Environment. 2018;268:162–170.
2. Muz D, Muz MN. Bal arılarının viral hastalıkları, tanı ve tedavisi. In: Özdemir N, editor. Veteriner Arı Sağlığı ve Apiterapi. Ankara: Türkiye Klinikleri, 2021; p. 24-36.
3. Tutkun E, Başgelmez A. Bal arısı zararlıları ve hastalıkları teşhis ve tedavi yöntemleri. Ankara: Bizim Büro Basımevi, 2003.
4. Gülpınar V. Bal arısı hastalık ve zararlıları. Teknik Arıcılık. 2005;87: 2- 7.
5. Uygur SÖ, Girişkin O. Bal Arısı Hastalık ve Zararlıları. Uludag Bee Journal. 2008;8:130-142.
6. Tantillo G, Bottaro M, Di Pinto A, Martella V, Di Pinto P, Terio V. Virus infections of honeybees *Apis mellifera*. Italian Journal of Food Safety. 2015;4:5364.
7. Berenyi O, Bakonyi T, Derakhshifar I, Koglbergern H, Nowotny N. Occurrence of six honeybee viruses in diseased Austrian Apiaries. Applied and Environmental Microbiology. 2006;72:2414-2420.
8. Anderson DL, Gibbs AJ. Inapparent virus infections and their interactions in pupae of the honeybee (*Apis mellifera* L.) in Australia. Journal of General Virology. 1988; 69:1617-1625.
9. Chen YP, Zhao Y, Hammond J, Heiti H, Evans J, Feldlaufer MF. Multiple virus infections in the honeybee and genome divergence of honeybee viruses. Journal of Invertebrate Pathology. 2004; 87:84-93.
10. Mokili JL, Rohwer F, Dutilh BE. Metagenomics and future perspectives in virus discovery. Curr Opin Virol. 2012; 2:63-77.
11. Galbraith DA, Zachary LF, Allyson MR, Axel B, Maryann F, Mary WG, Francisco IM. Investigating the Viral Ecology of Global Bee Communities with High-Throughput Metagenomics. Scientific Reports. 2018;8:1-14.
12. McMenamin AJ, Flenniken ML. Recently identified bee viruses and their impact on three bee pollinators. Curr. Opin. Insect Sci. 2018;26:120–129.
13. Schoonvaere K, De Smet L, Smagghe G, Vierstraete A, Braeckman BP, de Graaf DC. Study of the Metatranscriptome of Eight Social and Solitary Wild Bee Species Reveals Novel Viruses and Bee Parasites. Published in Front. Microbiol. Biology, Medicine Frontiers in Microbiology. 2018;9:1-12.
14. Bailey L, Ball BV, Woods RD. An iridovirus from bees. Journal of General

Virology. 1976;31:459-461.
15. Fujiyuki T, Takeuchi H, Ono M, Ohka S, Sasaki T, Nomoto A, Kubo T. Novel insect picorna-like virus identified in the brains of aggressive worker honeybees. Journal of Virology. 2004;78:1093-1100.
16. Chen YP, Pettis JS, Feldlaufer MF. Detection of multiple viruses in queens of the honeybee Apis mellifera L. Journal of Invertebrate Pathology. 2005;90:118-121.
17. Baker AC, Schroeder DC. The use of RNA-dependent RNA polymerase for the taxonomic assignment of Picorna-like viruses (order Picornavirales) infecting Apis mellifera L. populations. Virology Journal. 2008;5-10.
18. Govan VA, Leat N, Allsopp M, Davison S. Analysis of the complete genome sequence of acute bee paralysis virus shows that it belongs to the novel group of insect-infecting RNA viruses. Virology. 2000; 277:457-463.
19. Maori E, Lavi S, Mozes-Koch R, Gantman Y, Peretz Y, Edelbaum O, Tanne E, Sela I. Isolation and characterization of Israeli acute paralysis virus, a dicistrovirus affecting honeybees in Israel: Evidence for diversity due to intra and inter-species recombination. Journal of General Virology. 2007;88:3428-3438.
20. de Miranda JR, Drebot M, Tyler S, Shen M, Cameron CE, Stoltz DB, Camazine SM. Complete nucleotide sequence of Kashmir bee virus and comparison with acute bee paralysis virus. *J. Gen. Virol.* 2004; 85:2263-2270.
21. Leat N, Ball B, Govan V, Davison S. Analysis of the complete genome sequence of black queen-cell virus, a picorna-like virus of honeybees. Journal of General Virology. 2000; 81:2111-2119.
22. Lanzi G, De Miranda JR, Boniotti MB, Cameron CE, Lavazza A, Capucci L, Camazine SM, Rossi C. Molecular and biological characterization of Deformed wing virus of honeybees (Apis melliferaL.). J. Virol. 2006;80:4998–5009.
23. Ghosh RC, Ball BV, Willcocks MM, Carter MJ. The nucleotide sequence of sacbrood virus of honey bee: an insect picorna-like virus. *J. Gen. Virol.* 1999;80:1541-1549.
24. Olivier V, Blanchard P, Chaouch S, Lallemand P, Schurr F, Celle O, Dubois E, Tordo N, Thiery R, Houlgatte R, Ribière M. Molecularcharacterization and phylogenetic analysis of Chronic bee paralysis virus, ahoney bee virus. Virus Res. 2008;132:59–68.
25. Jan E. Divergent IRES elements in invertebrates. Virus Research. 2006;119:16–28.

26. Cox-Foster DL, Conlan S, Holmes EC, Palacios G, Evans JD, Moran NA, Quan P, Briese T, Hornig M, Geiser DM, Martinson V, van Engelsdorp D, Kalkstein AL, Drysdale A, Hui J, Zhai J, Cui L, Hutchison SK, Simons JF, Egholm M, Pettis JS, Lipkin WI. A metagenomic survey of microbes in honeybee colony collapse disorder. Science. 2007;318:283-287.
27. Doğaroğlu M. Modern arıcılık. İstanbul: Anadolu Matbaa ve Ambalaj San. Tic. Ltd. Şti., 1999.
28. de Miranda JR, Cordoni G, Budge G. The Acute bee paralysis virus–Kashmir bee virus– ısraeli acute paralysis virus complex. J ınvertebr Pathol. 2010;103:30-47
29. Bailey l, Gibbs AJ, Woods RD. Two viruses from adult honey bees (Apis mellifera linnaeus). Virology. 1963;21:390-5
30. Hung ACF. PCR detection of Kashmir bee virus in honey bee excreta. *J. Apic. Res.* 2000;39:103-106.
31. Ribie`re M, Ball BV, Aubert M. Natural history and geographic distribution of honey bee viruses. In: Aubert M, Ball BV, Fries I, Moritz RFA, Milani N, Bernardinelli I, editors. Virology and the honey bee, European Communities. Luxembourg, 2008, pp. 15–84.
32. Benjeddou M, Leat N, Allsopp M, Davison S. Detection of acute bee paralysis virus and black queen cell virus from honeybees by reverse transcriptase PCR. *Appl. Environ. Microbiol*. 2001;67:2384-2387.
33. Yue C, Schröder M, Bienefeld K, Genersch E. Detection of viral sequences in semen of honey bees (Apis mellifera): evidence for vertical transmission of viruses through drones. Journal of Invertebrate Pathology. 2006;92:105-8
34. Sanpa S, Chantawannakul P. Survey of six bee viruses using RT-PCR in Northern Thailand. J. Invertebr. Pathol. 2009;100:116–119.
35. Anonim. www.univet.huunitsParazitologiaownenglishbee, 2008a.
36. Handerson C, Tarver L, Plummer D, Seccomb R, Debnam S, Rice S, Bromenshenk J. US National Bee Colony Loss Survey: Preliminary findings with respect to Colony Collapse Disorder. Bee Alert Technology Inc, 2007.
37. Bakonyi T, Farkas R, Szendroi A, DobosKovacs M, Rusvai M.. Detection of acute bee paralysis virus by RT-PCR in honey bee and Varroa destructor field samples: rapid screening of representative Hungarian apiaries. Apidologie. 2002a;33:63-74.
38. Bakonyi T, Grabensteiner E, Kolodziejek J, Rusvai M, Topolska G, Ritter W, Nowotny N. Phylogenetic analysis of acute bee paralysis virus strains.

Applied Environmental Microbiology. 2002b;68:16446-16450.
39. Yue C, Genersch E. RT-PCR analysis of Deformed wing virus in honeybees (Apis mellifera) and mites (Varroa destructor). Journal of General Virology. 2005;86:3419–3424.
40. Allen MF, Ball BV. Characterisation and serological relationships of strains of Kashmir bee virus. Annals of Applied Biology. 1995;126:471-84.
41. Anderson D. Triggering virus replication in honey bees, Bee Research And Virus in Europe. Proceedings of the meeting in Sophia Antipolis; 2005 April 24-26; France.
42. Maramorosch K, Shatkin A. Honey bee viruses. Advances in Virus Research. Academic Press. 2007;33-80.
43. Cui L, Shen M, Ostiguy N, Cox-Foster D. Intricate transmission routes and interactions between picorna-like viruses (Kashmir bee virus and sacbrood virus) with the honeybee host and the parasitic varroa mite. Journal of General Virology. 2005;86:2281–2289.
44. Chen Y, Evans JD, Feldlaufer, M. Horizontal and vertical transmission of viruses in the honey bee, Apis mellifera. J ınvertebr Pathol. 2006;92:152-9.
45. Shen MQ, Yang Xl, Cox-Foster D, Cui lW. The role of varroa mites in infections of Kashmir bee virus (KBV) and deformed wing virus (DWV) in honey bees. Virology. 2005;342:141- 9.
46. Anonim. Pest management strategic plan for honey bees in the mid-atlantic states. Southern Region Ipm Center Virginia Tech North Carolina State University, Maarec. 2008b.
47. Tentcheva D, Gauthier l, Zappulla N, Dainat B, Cousserans F, Colin ME, Bergoin M. Prevalence and seasonal variations of six bee viruses in Apis mellifera l. and Varroa destructor mite populations in France. Appl Environ Microbiol. 2004;70:7185-91.
48. Bailey l, Woods RD. Three previously undescribed viruses from the honey bee. J Gen. Virol. 1974;25:175-86.
49. Valles SM, Chen Y, Firth AE, Guerin DMA, Hashimato Y, Herrero S, de Miranda JR, Ryabov E. ICTV Virus Taxonomy Profle: Ifaviridae. J. Gen. Virol. 2017;98:527–528.
50. Ye S, Xia H, Dong C, Cheng Z, Xia XL, Zhang JM, Zhou X, Hu YY. Identification and characterization of Iflavirus 3C-like protease processing activities. Virology. 2012;428:136–145.
51. Chen YP, Nakashima N, Christian PD, Bakonyi T, Bonning BC, Valles

SM, Lightner D. Family Iflaviridae. In: King AMQ, Adams MJ, Carstens EB, Lefkowitz EJ, editors. Ninth Report of the International Committee on Taxonomy of Viruses. Elsevier Academic Press. 2012; 846–849.
52. Norton AM, Remnant EJ, Buchmann G, Beekman M. Accumulation and competition amongst deformed wing virus genotypes in native Australian honeybees provides insight into the increasing global prevalence of genotype B. Front Microbiol. 2020;11:620
53. Bailey l, Ball BV. Honey Bee Pathology. Amsterdam, The Netherlands: Elsevier; 1991
54. Ryabov EV, Childers AK, Lopez D, Grubbs K, Posada-Florez F, Weaver D, Girten W, vanEngelsdorp D, Chen Y, Evans JD. Dynamic evolution in the key honey bee pathogen deformed wing virus: novel insights into virulence and competition using reverse genetics. PloS Biol. 2019;17:e3000502
55. Terio V, Martella V, camero M, Decaro N, Testini g, Bonerba E, Tantillo G, Buonavoglia C. Detection of a honey bee iflavirus with intermediate characteristics between kakugo virus and deformed wing virus. New Microbiologica. 2008;31:439-44.
56. Fujiyuki T, Ohka S, Takeuchi H, Ono M, Nomoto A, Kubo T. Prevalence and Phylogeny of Kakugo Virus, a Novel Insect Picorna-Like Virus That Infects the Honeybee (Apis mellifera L.), under Various Colony Conditions. Journal of Virology. 2006;80:11528– 11538.
57. Rortais A, Tentcheva D, Papachristoforou A, Gauthier L, Arnold G, Colin ME, Bergoin M. Deformed wing virus is not related to honey bees' aggressiveness. Virology Journal. 2006;3:61.
58. Akbay R. Arı ve İpekböceği Yetiştirme. Ankara Üniv. Zir. Fak. Yay. No: 1428, Ders Kitabı: 415. Ankara:A. Ünv. Basımevi, 1995.
59. Shimanuki H, Knox DA. Diagnosis of honey bee viruses. USDA, Handbook No: 690, USA:Academic Press., 2000
60. Öncüer C, Benlioğlu K. Balarısı zararlıları hastalıkları ve zehirlenmeleri. Adnan Menderes Üniversitesi yayınları no:3 1998;28-33.
61. Bailey L. Paralysis of the honey bee, Apis mellifera linnaeus. Journal of ınvertebrate Pathology. 1965;7:132-40.
62. Bailey L, Ball BV, Perry JN. Association of viruses with two protozoal pathogens of the honey bee. Ann Appl Biol. 1983;103:13-20
63. Ribiere M, Ball BV, Aubert MFA. Natural history and geographic distribution of honey bee viruses. In: Aubert MFA, Ball BV, Fries L, Morritz RFA, Milani N, Bernardinelli L, editors. Virology and the Honey Bee. Brussels,

Belgium: EEC Publications; 2008. p.15-84
64. Keene KM, Foy BD, Sanchez-Vargas L, Beaty BJ, Blair CD, Olson KE. RNA interference acts as a natural antiviral response to o'nyong-nyong virus (Alphavirus; Togaviridae) infection of Anopheles gambiae. Proc Natl. Acad Sci USA. 2004;107:17240-5.
65. Li H, Li WX, Ding SW. Induction and suppression of RNA silencing by an animal virus. Science. 2002;296:1319-21.
66. Voinnet O. RNA silencing as a plant immune system against viruses. Trends genet. 2001;17:449-59.
67. Atalay A. RNA İnterferans Kursu, s. 25, Ankara Üniversitesi Biyoteknoloji Enstitüsü Yaşam Bilimleri Kursları Serisi, Ankara, 2007.
68. RNA Interference, 2005/2006 Dharmacon Applications Handbook and Catalog, 2005; pp. 3- 5.
69. Agrawal N, Dasaradhi PV, Mohmmed A, Malhotra P, Bhatnagar RK, Mukherjee SK. RNA Interference: Biology, Mechanism, and Applications, Microbiology and Molecular Biology Reviews. 2003;67:657- 685.
70. Zeng Y, Cullen BR. RNA Interference in Human Cells is Restricted to The Cytoplasm. RNA. 2002;8: 855-860.
71. Reddy LS, Sarojamma, Ramakrishna V. Future of RNAi in Medicine. A Review. World Journal of Medical Sciences. 2007;2:1-14.
72. Cornman RS, Chen YP, Schatz MC, Street C, Zhao Y, Desany B, Egholm M, Hutchison S, Pettis JS, Lipkin WI, Evans JD. Genomic analyses of the microsporidian Nosema ceranae, an emergent pathogen of honey bees. PLoS pathog. 2009;5:e1000466.
73. Larsen A, Reynaldi JF, Guzmán-Novoa E. Fundaments of the honey bee (Apis mellifera) immune system. Review. Rev Mex Cienc Pecu. 2019;10:705-728.
74. Bernstein E, Caudy AA, Hammond SM, Hannon GJ. Role For A Bidentate Ribonuclease in The Initation Step of RNA Interference. Nature. 2001;409:363-366.
75. Zamore PD, Tuschl T, Sharp PA, Bartel DP. RNAi: Double-Stranded RNA Directs The ATP Dependent Cleavage of mRNA at 21 to 23 Nucleotide Intervals. Cell. 2000;101:25-33.
76. Brutscher IM, Flenniken MI. RNAi and antiviral defense in the honey bee. J ımmunol Res. 2015;2015:941897
77. Ryabov EV, Wood GR, Fannon JM, Moore JD, Bull JC, Chandler D, Mead A, Burroughs N, Evans DJ. A virulent strain of deformed wing virus (DWV) of honeybees (*Apis mellifera*) prevails after *Varroa destructor*-me-

diated, or in vitro, transmission. PLoS pathogens. 2014;10:e1004230.
78. Galbraith DA, Yang X, Nino EL, Yi S, Grozinger, C. Parallel epigenomic and transcriptomic responses to viral infection in honey bees (Apis mellifera). PLoS Pathog. 2015;11:e1004713.
79. Nissen I, Müller M, Beye M. The Am-tra2 gene is an essential regulator of female splice regulation at two levels of the sex determination hierarchy of the honeybee. Genetics. 2012;192:1015–1026.
80. Wilson MJ, Kenny NJ, Dearden PK. Components of the dorsal-ventral pathway also contribute to anterior-posterior patterning in honeybee embryos (*Apis mellifera*). EvoDevo. 2014;5:11.
81. Nunes FMF, Simoes ZLP. A non-invasive method for silencing gene transcription in honeybees maintained under natural conditions. Insect Biochemistry and Molecular Biology. 2009;39:157–160.
82. Mutti NS, Wang Y, Kaftanoglu O, Amdam GV. Honey bee PTEN—description, developmental knockdown, and tissue-specific expression of splice-variants correlated with alternative social phenotypes. PLoS ONE. 2011;6:e22195.
83. Barchuk AR, Figueiredo VLC, Simoes ZLP. Downregulation of ultraspiracle gene expression delays pupal development in honeybees. Journal of Insect Physiology. 2008;54:1035–1040.
84. Elias-Neto M, Soares MPM, Simoes ZLP, Hartfelder K, Bitondi MMG. Developmental characterization, function and regulation of a Laccase2 encoding gene in the honey bee, *Apis mellifera* (Hymenoptera, Apinae). Insect Biochemistry and Molecular Biology. 2010;40:241–251.
85. Nilsen KA, Ihle KE, Frederick K, Fondrk MK, Smedal B, Hartfelder K, Amdam GV. Insulin-like peptide genes in honey bee fat body respond differently to manipulation of social behavioral physiology. Journal of Experimental Biology. 2011;214:1488–1497.
86. Leboulle G, Niggebrügge C, Roessler R, Briscoe AD, Menzel R, Hempel de Ibarra N. Characterisation of the RNA interference response against the long-wavelength receptor of the honeybee. Insect Biochemistry and Molecular Biology. 2013;43:959–969.
87. Maori E, Paldi N, Shafir S, Kalev H, Tsur E, Glick E, Sela L. IAPV, a bee-affecting virus associated with colony collapse disorder can be silenced by dsRNA ingestion. Insect Molecular Biology. 2009;18(1)55-60. 95.
88. Desai SD, Eu YJ, Whyard S, Currie RW. Reduction in deformed wing virus infection in larval and adult honey bees (*Apis mellifera* L.) by dou-

ble-stranded RNA ingestion. Insect Mol Biol. 2012; 21:446-55.

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