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**MASTERS IN BUSINESS ADMINISTRATION (MBA)**

# AN EXPLORATORY STUDY OF DIGITAL TECHNOLOGY APPLICATIONS USED IN RESTAURANTS AND CAFES IN ANKARA

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I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work. **18/06/2019**

**Misagh, Haji Amiri**

**Signature:** 

## ABSTRACT

**An Exploratory Study of Digital Technology Applications Used in Restaurants and Cafes in Ankara**

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Over the past decades, digital technologies have invaded our daily life from all aspects. Such a digital revolution and features that it brings to the picture are changing the way people and business work together. Foodservice industry and specifically restaurant industry is not an exception from this phenomena. Numerous digital solutions for restaurants and cafes have been introduced and more of them are yet to come. Therefore, applying proper technological solution can be beneficial both for the business and for customers. Accordingly, assessing the current situation and development process of the technological solution into the foodservice industry is essential for countries that the foodservice industry plays an important role in their economy. Within this frame, this study aims to provide an insight into the current situation and future of technological solutions among restaurants and cafes in Ankara. This issue is studied from three different perspectives. First, in-depth interviews were conducted with managers of two businesses that create and provide technological solutions for restaurants and cafes in Ankara. Second, 18 structured interviews were conducted with restaurant owners and managers, in order to understand the existing mindset of Turkish decision makers on the topic of applying technological solutions for foodservice businesses. Finally, the survey data was collected from 261 customers in different locations of Ankara. The survey asked customers' opinion and interest level toward certain types of technologies. It was observed that combination of

technological solutions and traditional tools are being used in restaurants and cafes in Ankara. In addition, intention for investment in technology was high among restaurateurs. However, high prices of technological solutions and lack of knowledge considered as biggest barriers for adaptation of technology into the sector. Moreover, Self-Service Technologies (SST) such as tablet and tabletop menu was concerned to be as favorable among both for customers and restaurateurs.

**Keywords**: Digital Revolution, Technology, Restaurants, Foodservice

# ÖZET

## Ankara’da Restoranlarda ve Kafelerde Kullanılan Dijital Teknoloji Uygulamaları hakkında Keşfedici Bir Çalışma

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Geçen on yıllarda, dijital teknolojiler günlük hayatımızın her alanına yayıldı. Bu tür bir dijital dönüşüm ve ortaya çıkardığı özellikler, insanların ve işletmelerin birlikte çalışma şeklini değiştirmektedir. Yiyecek hizmeti sektörü ve özellikle restoran sektörü, bunun için bir istisna değildir. Restoranlar ve kafeler için çok sayıda dijital çözümler sunulmuştur ve bu çözümlerin birçoğu da henüz uygulamaya geçmemiştir. Bundan dolayı, doğru teknolojik çözümün uygulanması hem işletme hem de müşteriler için faydalı olabilir. Bu doğrultuda, yiyecek hizmeti sektörü için teknolojik çözümün mevcut durumunun ve gelişim sürecinin değerlendirilmesi, ekonomilerinde yiyecek hizmeti sektörünün önemli rol oynadığı ülkeler için zaruridir. Bu çerçevede, bu çalışmada, Ankara’daki restoranlar ve kafelerde teknolojik çözümlerin mevcut durumu ve geleceği hakkında bir anlayış sağlanması amaçlanmıştır. Bu konu üç farklı bakış açısıyla incelenmiştir. İlk olarak, Ankara'da restoranlar ve kafeler için teknolojik çözümler oluşturan ve sağlayan iki işletmenin yöneticisi ile derinlemesine mülakatlar yapılmıştır. İkinci olarak, Türk karar vericilerin yiyecek hizmeti işletmelerinde teknolojik çözümleri uygulama konusundaki mevcut zihniyetini anlamak için restoran yöneticileri ve sahipleri ile 18 yapılandırılmış mülakat gerçekleştirilmiştir. Son olarak, Ankara'nın farklı bölgelerindeki 261 müşteriden anket verileri toplanmıştır. Ankette, müşterilerin belirli teknoloji türlerine yönelik görüşleri ve ilgi düzeylerini sorulmuştur. Ankara'daki restoran ve kafelerde, teknolojik çözümler ile geleneksel araçların

bileşiminin kullanıldığı gözlemlenmiştir. İlaveten, restoran sahiplerinin teknoloji yatırımı yapma niyetlerinin yüksek olduğu belirlenmiştir. Ancak, teknolojik çözümlerin yüksek maliyetleri ve bilgi eksikliği, sektörde teknoloji adaptasyonu önünde en önemli engeller olarak değerlendirilmiştir. Bunun yanı sıra, tablet ve masa üstü menü gibi self-servis teknolojilerin (SST) hem müşteriler hem de restoran sahipleri için olumlu olarak dikkate alındığı ortaya çıkmıştır.

**Anahtar Kelimeler:** dijital dönüşüm, teknoloji, restoranlar, yiyecek hizmeti

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## DEDICATION

*This thesis is dedicated to my parents, my teachers and anyone who had a part in my upbringing and education.*

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## LIST OF ABBREVIATIONS

| | |
|---|---|
| AI | Artificial Intelligence |
| AR | Augmented Reality |
| BOH | Back of the House |
| CRM | Customer Relation Management |
| CPS | Cyber-Physical System |
| FOH | Front of the House |
| GDP | Gross Domestic Product |
| HCI | Human-Computer Interaction |
| Iot | Internet of Things |
| KDS | Kitchen Display System |
| POS | Point of Sales |
| PDA | Personal Device Assistance |
| RAISA | Robot Artificial Intelligence Service Automation |
| SST | Self-Service Technology |
| VR | Virtual Reality |

# CHAPTER ONE

# INTRODUCTION

One of the fastest growing topics among academics is digital revolution or Industry 4.0, which refers to ongoing forth industrial revolution due to digital technology leap and pace of innovation (Okano, 2017). However, the impact of this phenomenon on the service sector and especially the food service industry is understudied and need extra attention (Bullinger, Neuhuttler, Nagele, & Woyke, 2017; Shamim, Cang, Yu, & Li, 2017). Internet of things (IoT), cyber-physical systems (CPR) and, real-data processing are main topics that define the main concept of industry 4.0 (Okano, 2017). These topics may not seem much relevant to the foodservice industry but in fact, the core aspect of them already found their ways to restaurants and cafes. For example, IoT technologies, which is the ability to embed connectivity into any intelligence device, is making a huge impact on the speed and performance of restaurants and cafes from placing orders and pouring drinks to managing inventory and entertaining customers (Intel, n.d.). Even the futuristic approach to restaurant automation through robots and artificial intelligence (AI) are making their place not just in people's imagination but also into the actual kitchen of the restaurant for good reasons (Weiss et al., 2016).

We are living in the digital era where enterprises that neglect to adopt innovative technologies are vulnerable to falling behind their competitors and no industry is an exception from this notion. Digital options are transforming the way in which businesses are being done in all sectors even in those that are traditionally reliant on the human workforce. Foodservice industry, specifically restaurants and cafes, are currently undergoing such transformation (Sivalingam, 2019). According to a study

completed by the consultancy company PricewaterhouseCoopers in 2018, 73% of activities performed by humans in accommodation and food service sectors has the potential for automation (Hawksworth, Berriman, & Goel, 2018).

Every day more people upgrade their devices to "smart" versions. Today's customers are connected more than ever. it is estimated that by 2020 more than 44% of the European population will have grown up with digitization. (Preveden & Tiefengraber, 2016). According to the National Restaurant Association of United State, 32 % of 18-34 years olds stated that technologies such as mobile apps, tablets, online and electronic ordering factors into their choice for selecting a quick service restaurant (National Restaurant Association[NRA], 2016). The ongoing digital revolution and new technologies that it brings can create more interconnectivity leading to greater communication, which is crucial for business such as restaurants and cafes (Benjamin, 2018).

Studies in the hospitality and food service industry indicate that technologies such as robotics and artificial intelligence (AI) can have financial and non-financial benefits for travel, tourism and hospitality companies (Ivanov & Webster, 2017). Adopting relevant technological system can bring potential benefits for a restaurant by increasing the speed of service, reducing processing cost, increasing volume and revenue and improving service and food quality (Dixon, Kimes, & Verma, 2009; Kimes, 2008). Technologies such as smart oil management, robotic, cloud-based systems, tabletop technology, and smart inventory systems are just a few examples of features that can be applied to a foodservice business in order to operate more efficiently in a very controlled environment (Intel, n.d.). For example, a restaurant with tabletop technology, integrated tables with touchscreen feature, can significantly reduce dining time by 30% just by allowing their guest to order and pay through such systems (Susskind & Curry, 2018). In addition, new technologies and innovations not only can increase the performance of restaurants and allow it to operate faster and smother but also bring uniqueness to a business which can attract more customers especially millennials who are seeking for innovation and new ways of doing things

(Cross, 2017). For instance, a hamburger-making robot by the name Flippy was so popular on its first day at a restaurant in Los Angeles that could not keep up with the demand and it was forced to take a break (Graham, 2018).

## 1.1 Problem Statement

Service Industry is the most important industry for the Turkish economy. According to the Annual Industry and Service Statistics of TurkStat (Turkish Statistical Institute), 43.2% of the active enterprises in 2017 was operating in the service sector only. In addition to that, the service industry in Turkey has the highest share of the labor force that is 36.8% of the total employment in the country. Accommodation and food service activities play an important role in the service industry and contain 2.6% of total Gross Domestic Product(GDP) of Turkey in the year 2016 (Turkstat, 2016). Meanwhile, a survey done by Turkish Statistical Institute shows that internet usage of individuals was 72.9% in 2016 and purchasing food and groceries took the fourth rank among e-shoppers in Turkey (Turkish Statistical Institute, 2018).

There are over 3,800 hotels, 5,000 catering companies, and over 200,000 restaurants and cafes in Turkey, alongside 360 shopping malls featuring food courts. (Atalaysun, 2017). These facts illustrate the importance of the service industry and especially the food service industry for Turkey. Moreover, hospitality sector and especially restaurants industry has been always facing major challenges such as lack of qualified workforce, high rate of employee turnover, high rate of operational mistakes and, theft (Demicco et al., 2013; Kuo, Chen, & Tseng, 2017; Mathath & Fernando, 2017). These challenges and many others can be addressed by applying the right type of technology solutions. As a result, staying relevant to currently available technology and providing better service for customers with the help of recent technologies and innovations is crucial in order to face existing challenges for this industry.

## 1.2 Purpose of the Study

The purpose of this study can be defined with one main research question that asks about the current situation of technological solutions for restaurants and cafes in Ankara. Three separate but interconnected objective purposed in order to address this question properly. The first objective was to gather information about available technological solutions, existing barriers for adaptation and future of them in the sector. In order to achieve this, quantitative approach in the form of two in-depth interviews with experts conducted with firms that provide various technological solutions and services for foodservice businesses in Ankara. The second objective was to explore the existing mindset of Turkish restaurateurs and restaurant managers about technological solutions. What does seem important from their perspective, what makes them stop from adopting technology into their businesses and, what are they expecting from technology in the future? Besides that, the current level of applied technology and existing systems in restaurants and cafes wanted to be investigated. To do so, 18 structured interviews with restaurateurs and restaurant managers in Ankara conducted. The third and final objective was to understand Turkish customers' expectations and preferences for encountering specific types of technologies in restaurants and cafes. In order to achieve this goal, a survey about the interest level of customers toward certain types of technologies prepared and distributed among randomly selected people in restaurants and cafes in Ankara. 261 valid data collected and analyzed with the SPSS program.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Industrial Revolutions, Technology and Economy:

In order to fully understand the concept of industrial revolutions, it is essential to examine the history of Industrial Revolutions and how they evolved from past to present time. To do so, first, we study industrial revolutions as a whole and later we examine each industrial revolution one by one. Industrial revolutions started from a certain point of time in history and they kept happening since then. These events take a few decades to develop from the beginning to end and after each time they brought radical positive changes to the overall quality of human life that cannot be ignored (De Vries, 1994). Perhaps the first person who notices these patterns was Nikolai Kondratiev. He was a Soviet economist who attracted the attention of the world by analyzing the macroeconomic performance of leading economics of that time which was UK, USA, France, and Germany between 1790 and 1920 (Tichy, 2011). Kondratiev stated that these economies went through similar cycles or waves that range between 40 to 60 years and contains alternating interval between high sectoral growth and interval of relatively slow growth (Kondratiev, 1935) (Table 1 & Figure1).

Table 1. Kondratiev Cycles with the major invention of that period

| Kondratieff cycles | 1st Kondratieff | 2nd Kondratieff | 3rd Kondratieff | 4th Kondratieff | 5th Kondratieff |
|---|---|---|---|---|---|
| Period | 1780–1830 | 1830–1880 | 1880–1930 | 1930–1970 | 1970 to today |
| Invention | Steam engine | Railway, steel | Electrification, chemicals | Automobiles, petrochemicals | Information technology, communicati-ons technology |
| Area of application | Clothing | Mass transportation | Mass production | Individual mobility | Information and commu-nication |

Source: L. A. Nefiodow, "Der Sechste Kondratieff" ["The Sixth Kondratieff"], 2006; Table: Allianz Global Investors Capital Market Analysis

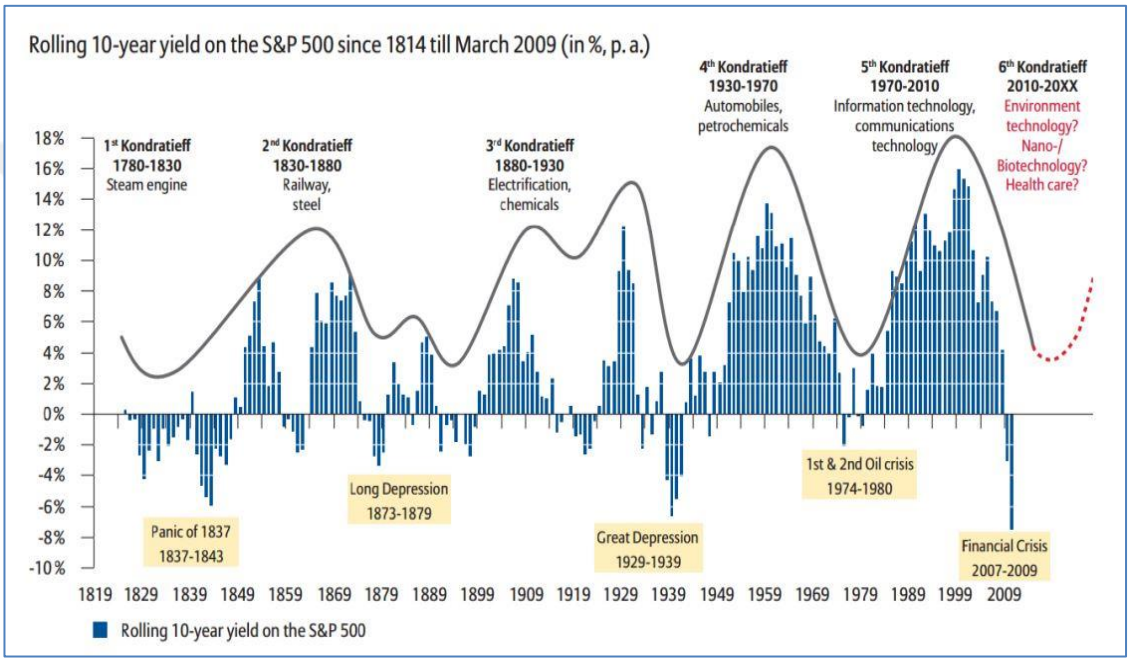



Figure 1. Kondratiev Waves from past till present

Kondratiev explained these economic behaviors by changes in technology, wars, the birth of new countries and the fluctuation in the production of gold (Kondratiev, 1935). Later Joseph Alois Schumpeter, who considered to be one of the leading economists in the 20th century, perfected Kondratiev idea by his theory of "Economic Development and Disruptive Technology" (Emami-Langroodi, 2017). Schumpeter added some internal factors such as political reasons, economic status and social factors for explaining those cycles that he named "Kondratiev Waves" (Tichy, 2011). Schumpeter was also the first person who claimed that these waves were the

effect of big innovations such as steam power and electricity that cause the big change in the world's economy and caused Industrial Revolutions (Tichy, 2011). Later he stated his theory of Creative Destruction based on that and today the world knows him as a man who discovered capitalism (Emami-Langroodi, 2017).

As it is illustrated in Figure 2, the Kondratiev waves have 4 phases that include expansion, deflationary growth, recession and stagflation that is the turning point between expansion and deflationary growth.

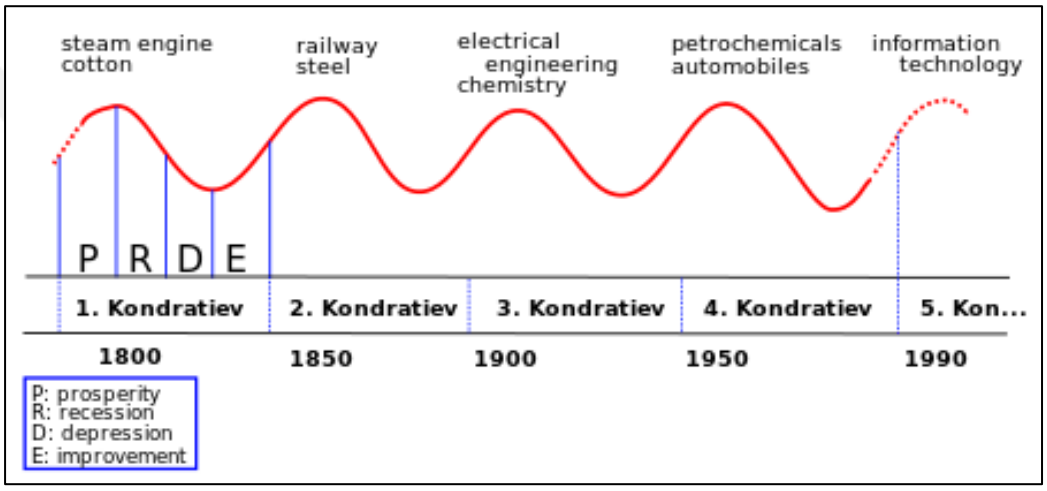



Figure 2. Stages of Kondratiev Waves

Almost all industrial revolutions followed such wave characteristic and in fact, the world is in the latest wave that caused by the innovation of the internet and its fast expansion in today's life (Cavusoglu, 2015). The industrial eras will be defined in detail in the following sections.

### 2.1.1 First Industrial Revolution

First Industrial Revolution (Industry 1.0) started in the 1760s by the invention of steam power and it almost took 70 years to develop completely. Since this

phenomenon started in the United Kingdom it is also known as the British Industrial Revolution but soon enough it spread to all over the world (De Vries, 1994). In this period, the production cycle evolved from physical human strength to machine power resulting in higher quantity and improved quality. This dramatic change in production made a huge impact on the structure of the world economy and its growth, for the first time in history. In fact, Angus Maddison (2007), who considered as one of the best economic historians, states that there was almost no growth in the world for about eight centuries until the British Industrial Revolution (Figure 3). Before that, Countries were rather similar and most of the people were poor and lived in agricultural environments. After that point, income started to rise and this process spilled over continental Europe and into what Maddison called "European Offshoots" which are the United States of America, Canada, and Australia (M. Spence & Hlatshwayo, 2011).

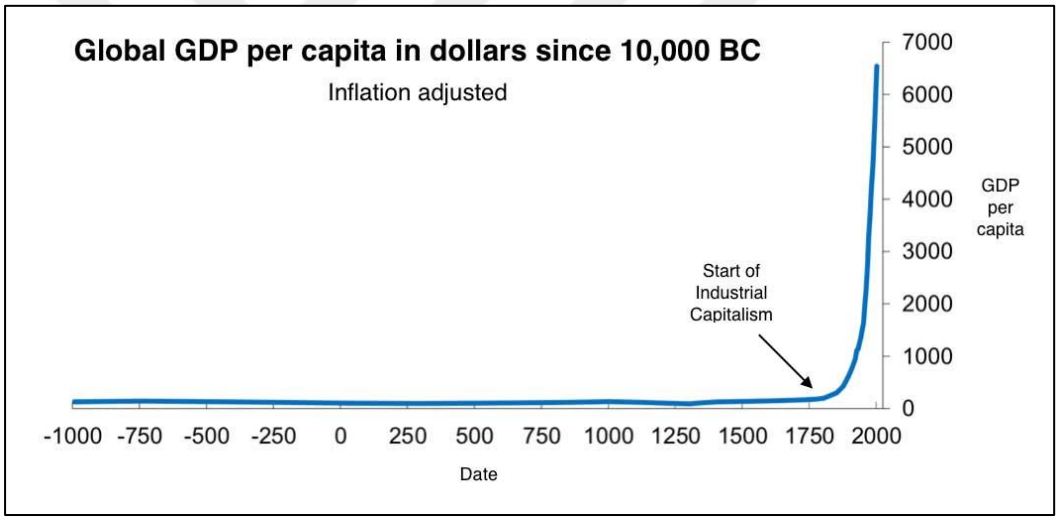



Figure 3. Average Global GDP since 10,000 BC

The first industrial revolution not only had a significant role in the world economy but also on its social structure. After that point, everyday life became significantly easier that lead to a better quality of life and increase in population and the average length of life. As the first Industrial revolution proceeded its journey, European countries turned to Near, Middle, and Far East countries that resulted in more sources, production and higher trade among their markets. At the end of the first

industrial revolution, not only the industrial aspect of human life evolved but also its social and international relations shaped as well (De Vries, 1994).

### 2.1.2 Second Industrial Revolution

The second Industrial Revolution does not happen immediately after the first one. Although it usually dated between 1870 and 1915, some of its characteristics started in 1850 (Mokyr, 1998). In general, the second industrial revolution or Industry 2.0 accelerated the mutual feedback between science and technology. It extended the limited and localized achievements of the first industrial revolution to the much broader range. The purchasing power of money for middle and working class increased rapidly which lead to higher living standards (De Vries, 1994). The second industrial revolution turned the large technological system from exceptions to commonplaces. Basically, Industry 2.0 was a chain of innovation and success that leaded one to another and final result of them were mass production and abundance of products. Electricity was the most important innovation of that era which superior the steam power and ensured that the machines are further advanced for mass production. Electricity made the production of steal cheaper and easier which lead to its mass production and expansion of railroads that allowed products and raw materials to move much faster for long distances. Meanwhile, the telephone or “talking telegram” was invented, which was a huge step by the mean of communication. There were also some achievements in other sectors such as agriculture and food processing, household technology and human welfare but they were not as significant as those mentioned. These series of innovations and achievement lead to the development of the heavy industry and prepared the way for the upcoming industrial revolutions (Mokyr, 1998).

### 2.1.3 Third Industrial Revolution

After World War II, the world was ready for its Third Industrial Revolution

in the 1960s. This industrial revolution directed by the shift of mechanical and analog electronic technology to digital electronics. It all started with the development of digital technology and the invention of an electrically driven mechanical calculator that lead to basic modern computers. This was a huge step in the development of communication technologies along with the supercomputers. For the first time in history, the man was capable of solving multiple and complex problems in a very short time that allows him to reach beyond its imagination. At the same time, new types of energies such as nuclear, wind, thermal and solar were emerging to decrees the level of dependency of human to oil and other fossil fuel energies. The turning point in this era was the discovery of internet which connected world more than ever and resulted in an explosion of knowledge that leads to numerous innovation in almost all sectors. Fields such as nanotechnology biotechnology, artificial intelligence (AI), robotics, quantum computing, and 3-D printing are the most recent and still advancing topics that are the result of this breakthrough technology (Rifkin, 2012).

### 2.1.4 Fourth Industrial Revolution

The term "Industry 4.0" introduced for the first time in the year 2011 at Honnavor Trade Fair and it originated from a project in the high-tech strategy of the German government. Experts suggested that the modern industrial revolution has arrived in the information era and when the German government took these suggestions seriously, the fourth industrial revolution by the name of Industry 4.0 was established. After the trade fair, a working group on Industry 4.0 was formed. One year later, the group presented the final report on the actual implementation of Industry 4.0 to German government at Hannover Fair in 2013 (Okano, 2017).

Industry 4.0 contains a vision for tomorrow's manufacturing where products find their way independently through the production process (Moavenzadeh, 2015). Intelligent factories, machines, and products communicate with each other and cooperatively drive production where raw materials and machines are interconnected

within the Internet of Things (IoT). The objectives in Industry 4.0' vision are highly flexible, individualized and resource friendly mass production (Deloitte, 2015).

Three paradigms can explain the core aspect of Industry 4.0 according to experts (Okano, 2017; Weyer, Schmitt, Ohmer, & Gorecky, 2015); the smart product, the smart equipment or machine and augmented operator. The smart product refers role of the final output as an active role of a system that has a memory and collects data and information after production. The second paradigm refers to smart equipment that uses edge technology and sensitive sensors in an interconnected platform to operate side-by-side humans. Such platform described by Cyber-Physical Production System (CPPS). The last paradigm which is augmented operator targets the worker who needs to operate in the explained environment while they provide required technical support to that environment (Weyer et al., 2015).

#### 2.1.4.1 Characteristics of Industry 4.0

Industry 4.0 can be considered as the next generation of digitalization in manufacturing which enables firms to customize their output at a lower cost and better quality. Such smart businesses with a high level of automation and efficiency can vary widely from one industry to another; however, they share some mutual specifications and characteristics (Nilsen & Nyberg, 2016). Literature research reveals that there are four main characteristics for defining Industry 4.0; vertical networking of smart production, horizontal integration through value chain network, end-to-end engineering and exponential technologies (Deloitte, 2015; Nilsen & Nyberg, 2016) (Figure 4).

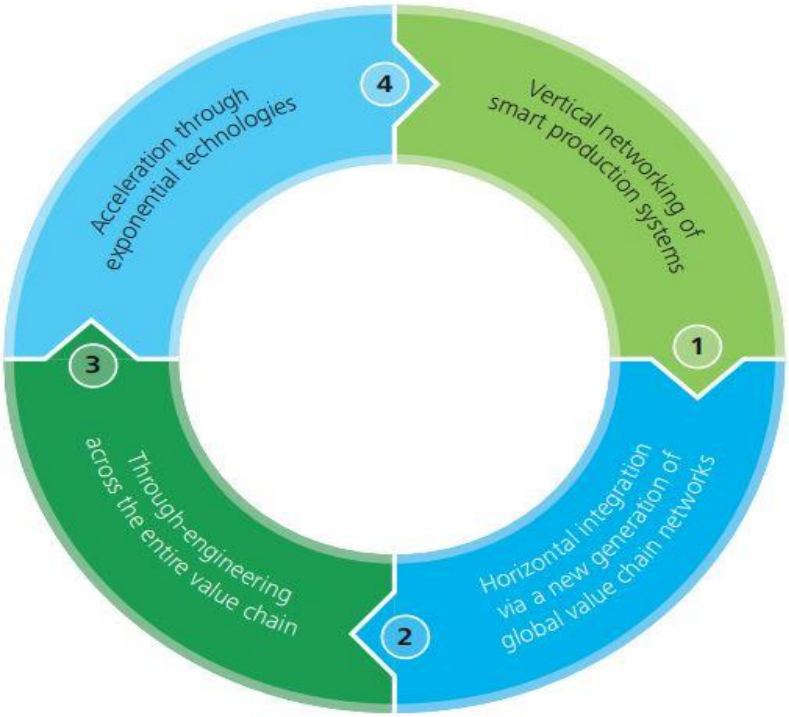



Figure 4. The four characteristics of Industry 4.0

The first main characteristics of Industry 4.0 is the vertical networking of smart production in a factory. This characteristic can be achieved by connecting machines and devices within a system inside the firm that it is highly dependent on information sharing through sensors, control system, and cloud-based solution. Such a system named Cyber-Physical Production System (CPPS) or Cyber-Physical Production (CPS) that allow the production customer-specific and individualized. CPS create an autonomous organization of production management that increase a firm's performance and its resource efficiency (Deloitte, 2015).

The second main characteristic of Industry 4.0 is horizontal integration via a new generation of the global value chain. This means that a firm should consider itself as a part of a global value chain network and position itself accordingly (Nilsen & Nyberg, 2016). Various departments of a firm such as a warehouse, R&D, purchasing, production, and sales not only can monitor and exchange product data in real-time but also can access history of any part or product at any time. This enables integrated

transparency within the firm and achieves a high level of flexibility that allows it to respond more rapidly and accurately to problems and challenges that occurs within an organization or market. Moreover, this kind of horizontal integration facilitates global optimization and generate completely new business models and new models of cooperation in the future (Nilsen & Nyberg, 2016).

The third main characteristic of Industry 4.0 is lifecycle management and end-to-end engineering through the entire value chain. Engineering the product life cycle to obtain a model is an achievable goal with the help of rapid development within the area of virtualization and communication. Designing and developing new product or service need seamless engineering through the product lifecycle. This coordinated production system enables new synergies to be created between product development and production system itself (Deloitte, 2015).

The last and fourth characteristic of Industry 4.0 is the impact of exponential technology on industrial processes. This characteristic can be considered as the most important one because it helps and feeds other characteristics of Industry 4.0 by acting as an accelerant or catalyst (Deloitte, 2015). For example, advanced robotics and sensor technology with the help of Artificial Intelligence (AI) have the potential to allow individualized solutions, flexibility, and cost savings for industrial processes. Another good example is additive manufacturing or 3D printing that allows new manufacturing solutions and new supply chain solutions or a combination of both for creating new business models (Nilsen & Nyberg, 2016).

## 2.2 The Importance of the Service Industry for the Turkish Economy

The service industry is the most important industry for the Turkish economy not only because of its highest share in the labor force but also for the high rate of active enterprises in Turkey (Turkstat, 2016). According to annual industry and service statistics report, 41.7% of the active enterprises in 2015 was in the service sector only.

Moreover, 36.8 % of total Turkey's labor force occupied by service sector alone which followed by 28% in industry, 22.6% trade and 11.8 % construction sector (Figure 5).

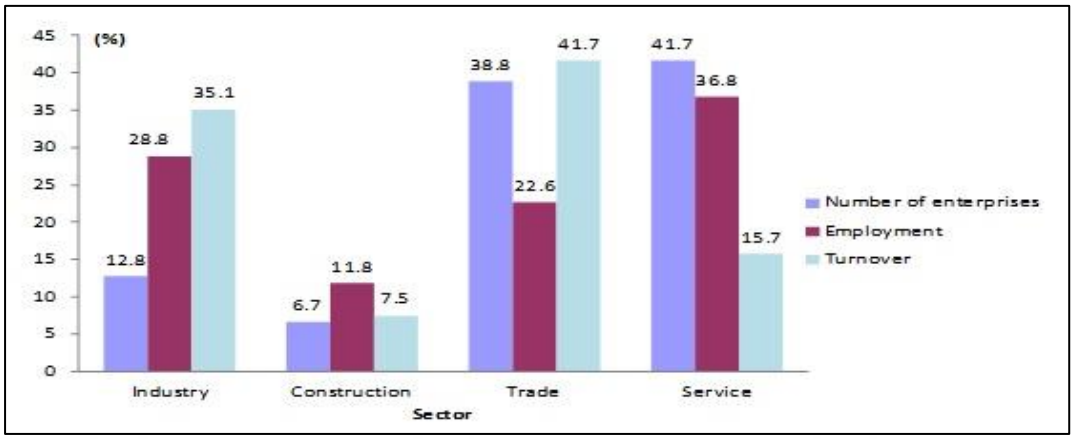



Figure 5. Percentage number of enterprises, employment, and turnover by sectors in 2015 (Source: Turkish Statistical Institute)

If we categorize Turkish Gross Domestic Product in three sections of Agriculture, Industry, and Services, the service sector dominates Turkey's GDP by 60.72% of the total share, which follows by 32.36% and 6.93% in industry and agriculture sectors respectively in the year 2016 (Turkstat, 2017).

### 2.2.1 The Economic Impact of the Food Service Industry on Turkish Economy

According to Turkish Statistical Institute Report in 2016, accommodation and food service activities has 2.6% of total GDP of Turkey, which is the same amount as human health and social service activities and higher than information and communication (Turkstat, 2016). The Turkish food and beverage industry is a 300 billion dollar market with approximately 40,000 companies operating in the sector. Turkey's Hotels and Restaurants Institutes (HRI) sector represents around 6% of Turkey's total food and drink market. There are over 3,800 hotels, 5,000 catering companies, and over 200,000 restaurants and cafes in Turkey, alongside 360 shopping malls featuring food courts (Atalaysun, 2017).

Half of the 80 million population of Turkey is below the age of 35 and this young population is one of the major factors that drive consumer behavior such as

traveling and eating out (Atalaysun, 2017). Hotel and Restaurant Industry (HRI) is around 20 billion US dollar market in Turkey. Istanbul (a most populated city in Turkey) generate 43% of the HRI sector's revenue alone and five cities of Muğla, Antalya, Izmir, Ankara, and Bursa generate 30 % of that revenue. The remainder is generated throughout the rest of Turkey. Over half of this revenue belongs to fast food and restaurants combined, with hotels as the next largest, and then under ten percent each for bakeries/patisseries, coffee shops, food stalls, and catering companies/schools (Atalaysun, 2017).

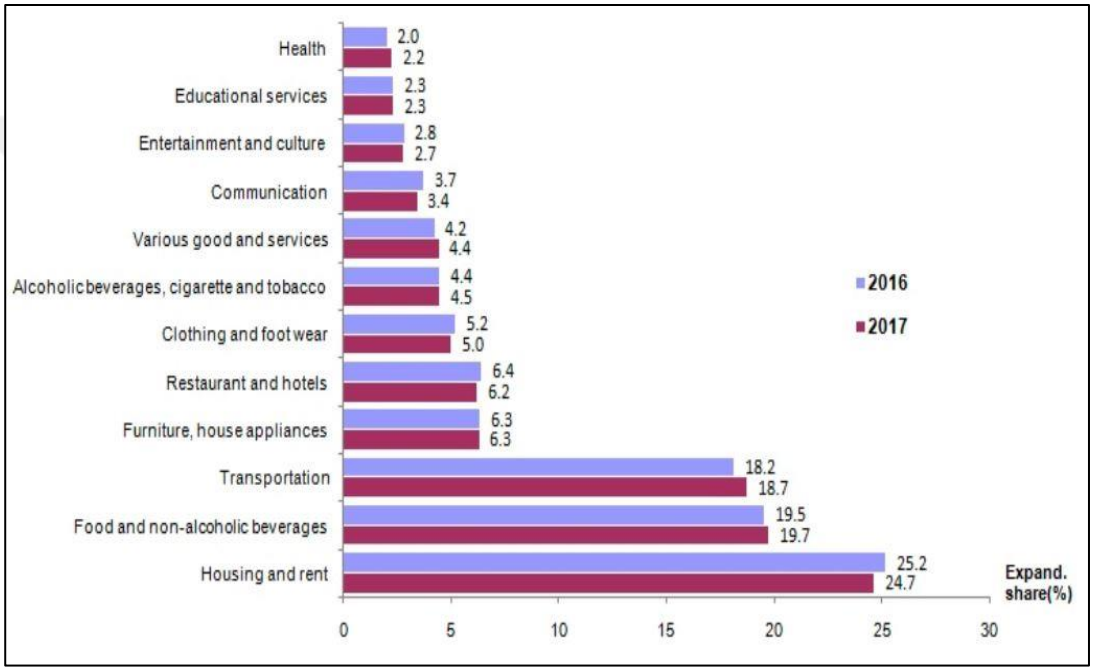



Figure 6. Distribution of Turkish household consumption expenditure in 2016 and 2017

According to the Turkish Statistical Institute, expenditure on restaurants and hotels take 6.2 % of household consumption expenditures in the year 2017 for Turkish families while it was 6.4% in 2016 (Figure 6). This is fourth place in total household consumption expenditures and comes after housing, food, and transportation respectively (TurkStat, 2018).

Table 2. Distribution of consumption expenditures by quintiles ordered by income, 2016, 2017 (Source: Turkish Statistical Institute)

(%)

| | The lowest quintile (First quintile) | | The highest quintile (Last quintile) | |
|---|---|---|---|---|
| Expenditure type | 2016 | 2017 | 2016 | 2017 |
| Total | **100.0** | **100.0** | **100.0** | **100.0** |
| Food and non-alcoholic beverages | 28.9 | 28.6 | 14.2 | 14.6 |
| Alcoholic beverages, cigaratte and tobacco | 5.2 | 5.4 | 3.3 | 3.6 |
| Clothing and footwear | 4.6 | 4.0 | 5.5 | 5.4 |
| Housing and rent | 32.0 | 31.9 | 21.7 | 20.9 |
| Furniture and houses appliances | 5.6 | 5.7 | 6.5 | 6.7 |
| Health | 2.1 | 2.2 | 2.1 | 2.3 |
| Transportation | 8.9 | 10.2 | 22.8 | 23.9 |
| Communication | 2.9 | 2.7 | 3.7 | 3.3 |
| Entertainment and culture | 1.7 | 1.5 | 3.6 | 3.4 |
| Educational services | 0.6 | 0.7 | 4.1 | 3.9 |
| Restaurant and hotels | 4.6 | 4.5 | 7.6 | 7.1 |
| Various good and services | 3.0 | 2.7 | 5.0 | 5.1 |

Figures in table may not add up to totals due to rounding.

In addition to that, when we look at the distribution of consumption expenditures by quintiles ordered by income in 2017, restaurant and hotels expenditures was 7.1% for households in the fifth quintile (the highest quintile). Table 2 compares this distribution for the year 2016 and 2017 (TurkStat, 2018).

### 2.2.1 Food Eaten Away from Home in Turkey

Unfortunately, there are no official statistics for the number of people who eat their meal out of the house and how much they spent on which types of restaurants. However, on December 2017 a private survey was conducted by a research and consulting company by the name of Konda with cooperation of Metro Toptancı Market about Turkish people eating and drinking habits. On the survey, which was done on almost 3000 individuals from 163 different regions in Turkey, 65 % of participant stated that they usually eat out of their houses. The average amount of money spent on each person was 30 Turkish Lira (Konda, 2017).

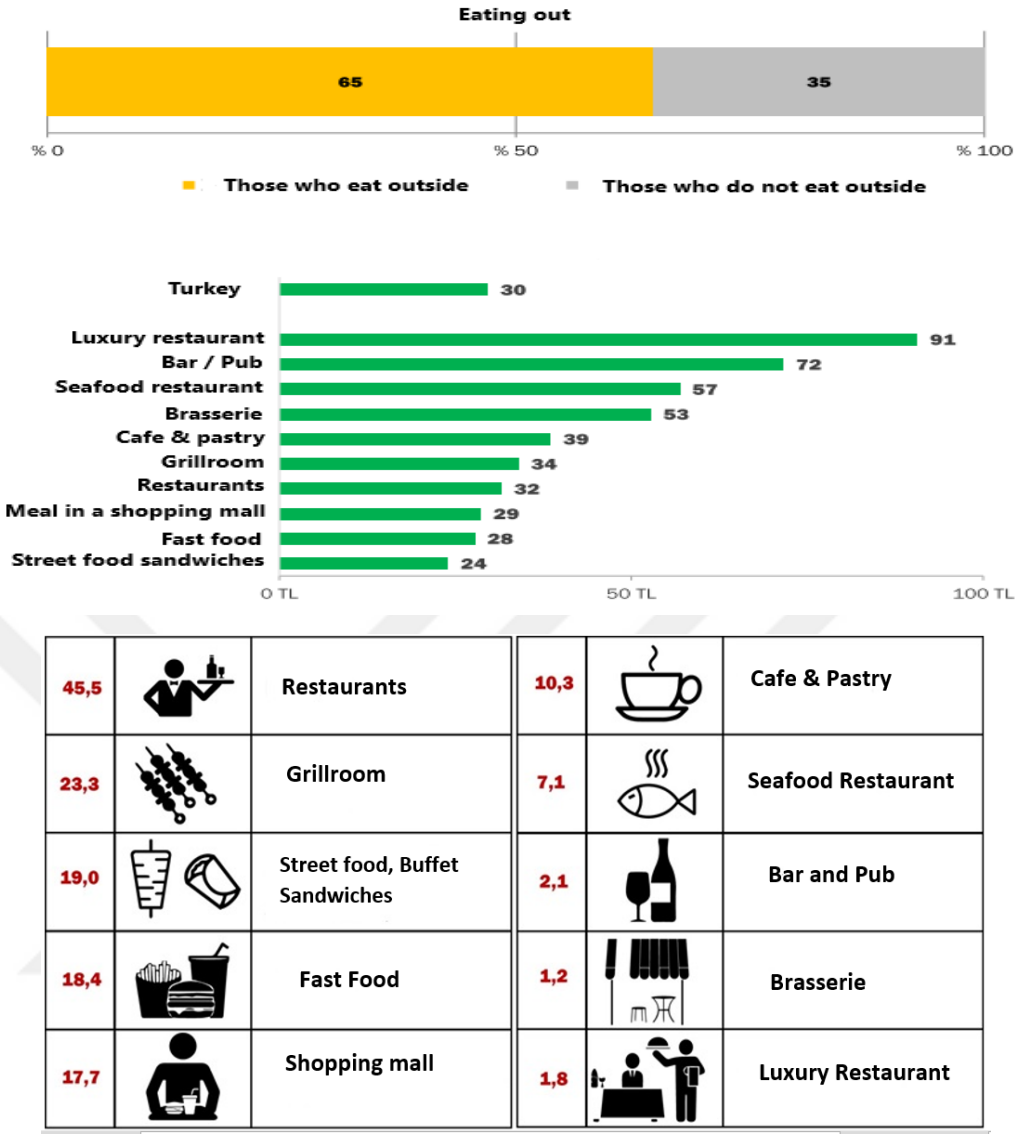



Figure 7 . Habit of eating outside and types of restaurant that Turkish people go when they eat out (Source: Konda, Research & Consulting Company)

Moreover, the following result obtained when the participants were asked about the types of places they go when they are eating out (Figure 7). As it is illustrated, most Turkish people have their meals in an ordinary restaurant (*Lokanta*) that serve traditional Turkish food. Grillrooms (*Kebapçı*) is the second most visited place among Turkish people and it follows by buffet Sandwiches (*Dönerci*) and fast food restaurants. The least visited places where brasserie (*Birahane*) and luxury restaurants among Turkish people (Konda, 2017).

## 2.3 Technology for the Restaurants Industry

The evolution of food service technology from low-tech to high-tech has a very long history (Table 3). The turning point starts in the 1990s with the introduction of new packaging systems and convenience/availability of high tech devices in the kitchen, which allowed the development of new highly effective business models into the market (Pantelidis, 2009). The rapid leap and development in digital technology raise the question that how these technologies will enhance and improve customers dining experience in the coming years. People in the field believe that there is tremendous scope for revolutionizing the experience and even behavior of our eating and drinking by means of the intelligence marriage of dining with the latest digital technology (Spence & Piqueras-Fiszman, 2012: 311).

Table 3. History of Food Service Technology

| **Food service industry; from low-tech to high -tech.** |
|---|
| BC |
| 500 "Ta Dionisiaka" banquets dedicated to the God of wine in Ancient Greece. |
| 100 "the Thermopolium" snack bar sells hot food and drinks in Pompeii, Italy. |
| AD |
| 1280 - Innkeepers in Florence Italy form an association. |
| 1425 -The Swan Inn of Lavenham, England, opens. |
| 1633- First Restaurant in the US opened in Boston by Samuel Coles |
| 1809 - Nicholas Appert, preserves foods in sealed wine bottles. |
| 1865 - Bookbinders Restaurant opens in Philadelphia |
| 1876 - Fred Harvey revolutionises foodservice in the rail industry with his chain of restaurants |
| 1919 - The National Restaurant Association is formed |
| 1925 - Howard Johnson opens first ice cream restaurant in Wolaston, Mass |
| 1940s - White Castle, one of the first fast food restaurants opens. |
| 1950s -McDonalds, Burger King Kentucky Fried Chicken Follow. |
| 1960s - Home delivery grows |
| 1970s - Drive through windows |
| 1980s - Ethnic foods explode, takeout and home delivery of foods increase. |
| 1990s - Advancements in packaging, sous-vide vacuum cooking, convenience and high tech foods. |
| 1997 - Yo, sushi Japanese restaurant that uses Robots to serve food opens in London. |
| 2000+ New advancements in Biotechnology, IT and web technologies revolutionize the way restaurants do business |
| Source: Adapted from Bollaffi &Lulay (1989) |

New technologies and innovations not only can increase the performance of restaurants and allow it to operate faster and smother but also bring uniqueness to a business which can attract more customers especially millennials who are seeking for innovation and new ways of doing things (Cross, 2017). Literature review indicates that there are various studies that show applying relevant type of technology for proper restaurants can be beneficial for the business in topics such as; revenue, efficiency, speed, quality of service, management, customer satisfaction and safety (Dixon et al., 2009; Frontline, n.d.; Kansakar, Munir, & Shabani, 2017; Kimes, 2008; H.-Y. Wang & Wu, 2014). Adopting a relevant technological system can bring potential benefits for a restaurant by increasing the speed of service, reducing processing cost, increasing volume and revenue and improving service and food quality. Systems such as kitchen display systems (KDS) and table management system can result in advancing food production and tightening service time while communications technologies and handheld devices can reduce the order taking time and shortening payment (Kimes, 2008). Technologies such as Self-Service Technology (SST) enables customers to consume different benefits and services on their own, independent of the involvement of an employee at a company which results in increased level of satisfaction in customers, lowering cost and creating brand loyalty for the business (Kincaid & Baloglu, 2008). Self-service technologies and off-site ordering/reservation systems will assist staff and can result in lowering labor costs in the restaurant. Moreover, online reservation or ordering make the restaurant more accessible for customers, which result in higher revenue for the restaurant (Kimes, 2008).

According to Spence (2014), there has been an enormous growth in modernist cuisine in recent years that relied on the development and use of new technologies in the kitchen. Although one may see the major of such technologies in the press releases or news stations, various technologies have already found their way unannounced into many of restaurant environment (Spence & Piqueras-Fiszman, 2014: 312).

The level of technology does not necessarily need to be very high or complex for providing a unique dining experience. A good example to illustrate this point is a famous seafood dish by the name of "The sound of the sea" that is served in The Fat Duck restaurant in Bray, UK. This dish has been a signature of this successful restaurant for so many years. The stylish dish with a seashore theme comes with an empty seashell that has iPod earphones (Figure 8). The iPod plays a soundscape of crashing waves and seagulls that was developed by a London-based sonic design agency. Such simple technology involvement with the perfect dish has the potential of transforming dining to strong emotional experience for some people (Spence & Piqueras-Fiszman, 2012: 315-316).

Figure 8. "The sound of the sea", the Famous dish in The Fat Duck restaurant

Restaurant technology can also come with Human-Computer Interaction (HCI) as a form of food-related augmented reality (AR) or virtual reality (VR). Although it may seem like a weird and strange concept for a dining experience, it attracted a growing amount of researcher in Human-Computer Interaction community over the recent years (Tanaka, Koizumi, Uema, & Inami, 2011). For instance, "Chewing Jockey" is a decent food related augmented reality (AR) that enhance the eating experience by creating or filtering sound effect with jaw motion (Figure 9). This system consists of three main elements for designing/filtering sound effect, bite detection and self-feedback system. Creators of Chewing Jockey believe their creation

can enhance the eating sensation for dentures users or those who are not able to bite strongly because of their medical condition. They also claim that their device can be used for entertainment and chewing game experience such that when the user starts to chew, they will hear sounds (e.g. screaming) which make the food feel like a living creature inside the user month. Alternatively, it can make the sound effect of super crispy potato chips for each bite (Koizumi, Uema, & Inami, 2011).

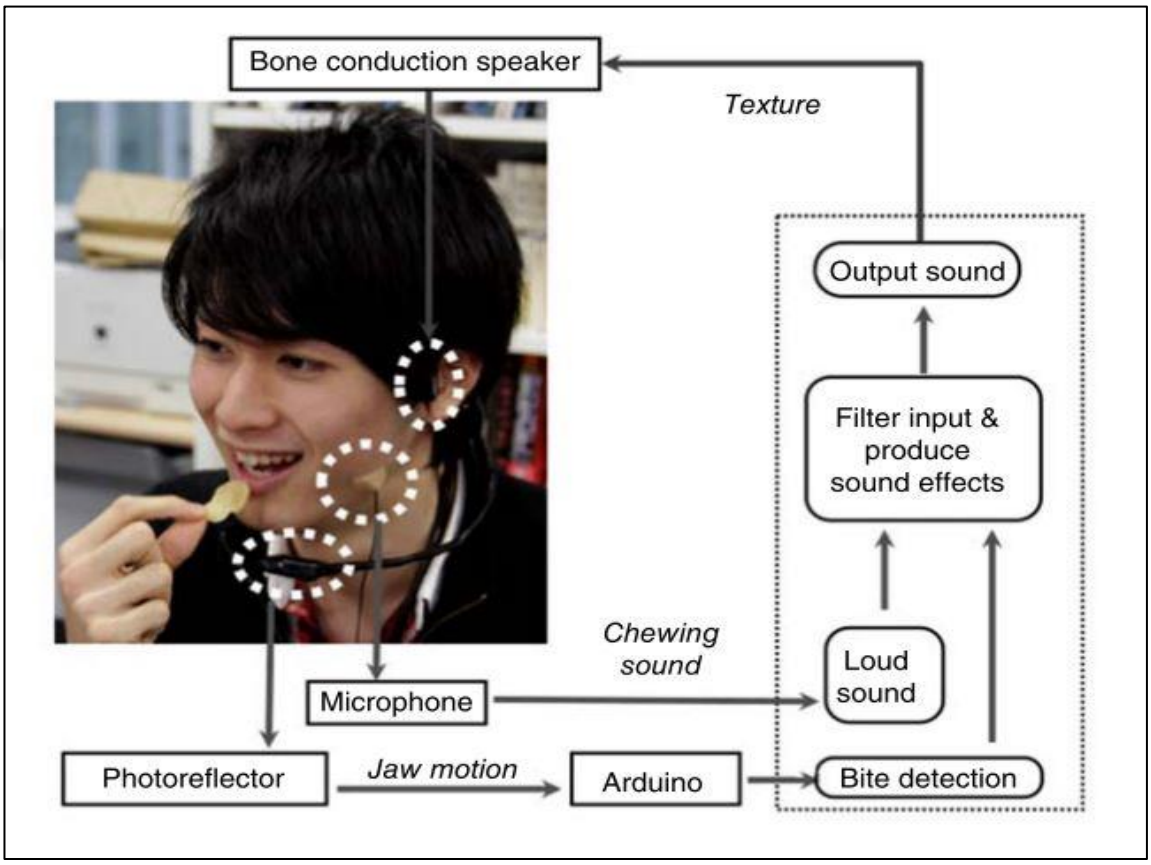



Figure 9. Chewing Jockey, an augmented reality device

### 2.3.1 Benefits of Technology for Customers and Guest Experience

Technology systems in a restaurant can benefit customers by improving their dining experience. Improved convenience and increased control are the two main benefits of technology for customers in a restaurant. When customers are provided with higher substantial control over their provided service, they are more likely to be

satisfied (Dixon et al., 2009). Increased control of customer in a restaurant can appear as behavior control, cognitive control, and decisional control. Behavioral control relates directly with the influence and power of customers for modification of their service. For example, customizing orders and choosing the time of serving at the desired table can enhance behavioral control for customers in the restaurant. Cognitive control concerns with the predictability of a situation for customers in the restaurant. For instance, providing the estimated time for delivering a service to customers can enhance their cognitive control over their provided service. Decisional control is the degree of freedom that customers can have by choosing among a selection of outcomes and goals. For example, the paging system can give options for customers who are waiting to be seated weather to stay in the restaurant or leave and return when their table is ready (Dixon et al., 2009; Kimes, 2008)

### 2.3.2 Effect of Technology on Dining Experience

Depending on the stage of dining, technology can play an important role in the dining experience in the restaurants. Various types of technology can be applied in order to enhance managing customer dining experience. In general, the dining experience consists of six stages (Kimes, 2008):

1) Pre-arrival: Time period from when customers decide to go to a restaurant until they actually arrive at the restaurant
2) Post-arrival: Time period from the arrival of customers until they are seated at their table
3) Pre-process: Time period from when customers are seated until they place their order
4) In-process: Time period from when customers receive their order until they ask for their cheek
5) Post-process: Time period from when customers request for check until they leave the restaurant
6) Table turnover: Time period from when customers leave their table until the table is reseated again

Each stage of dining experience can benefit from technology systems that specifically designed to enhance the performance of the restaurant. During the pre-arrival stage, the restaurant should provide options such as preordering (whether online or with a phone call), online reservation/ordering in order to give more control to customers for managing their time. The goal of the post-arrival stage is to minimize waiting and seating process for customers or at least make it predictable. Table management systems (TMS) and communication systems provide tools for restaurant operators to achieve these goals. With the help of such technologies, managers in the restaurants can track when tables are available and specify accurately the waiting times. Moreover, it allows managers to determine the right table that best fits the party and customers prefer. Pre-process stage can benefit from two primary technology of handheld devices and communication systems that allow speeding up the ordering time. Handheld order-taking technology is specifically designed for reducing order time and improve quality of service provided by allowing servers to give more attention to customers and provide them with more detail and information on items that are being ordered. During the in-process stage, technologies such as kitchen display system (KDS), TMS and communication and paging devices can give control to the pace at which the meal is prepared and ensure that orders are being prepared in a timely fashion. Tightening the post-process stage is crucial to not only improve customer satisfaction but also allowing greater customers to be seated in busy times. Beside TMS and communication systems discussed above, different types of payment methods through handheld devices can speed up the payment process (Kimes, 2008).

## 2.4 Restaurant Technology Applications/Systems

Nowadays, many restaurants apply various types of technology in their businesses in order to operate with fewer mistakes, higher productivity, and improved marketing know-how. The digital age has created a wave of technological applications and systems that changed the way restaurants operate and monitor their actions (Frederick et al., 2013: 116). In general, the restaurant's structure is divided into two

main parts, which are Front of the House (FOH) and Back of the House (BOH). Any operation related to customers in the dining areas such as taking orders, delivering food and completing payment belongs to the front of the house (Walker, 2010). Back of the house or back-office are areas that relate with purchasing, receiving, storage, food preparation, service, dishwashing area, sanitation, accounting, budgeting and control (Meyer & Vann, 2013: 152). Technologies used in restaurants are also split into two main groups; systems/applications that are used in FOH operations and those used in BOH operations. Moreover, there are systems that integrate both parts so that operators can input and extract information from both programs (Walker, 2010: 392). There are also technologies such as robots and artificial intelligence (AI) that can be applied on both the front of the house and the back of the house (Mathath & Fernando, 2017: 293). In this section, first we discuss this technology and later we take a look at technologies related to BOH and FOH separately.

### 2.4.1 Robots, Artificial Intelligence, and Service Automation

According to a study done by PricewaterhouseCooper worldwide in 2018, 73% of activities performed by humans in accommodation and food service sector has the potential for automation (Figure 10). In their study, they also mentioned Turkey with having 33% potential jobs at risk of automation. Moreover, Turkey is considered as a country that has relatively high exposure to later waves of automation but relatively lower exposure in short term (Hawksworth et al., 2018).

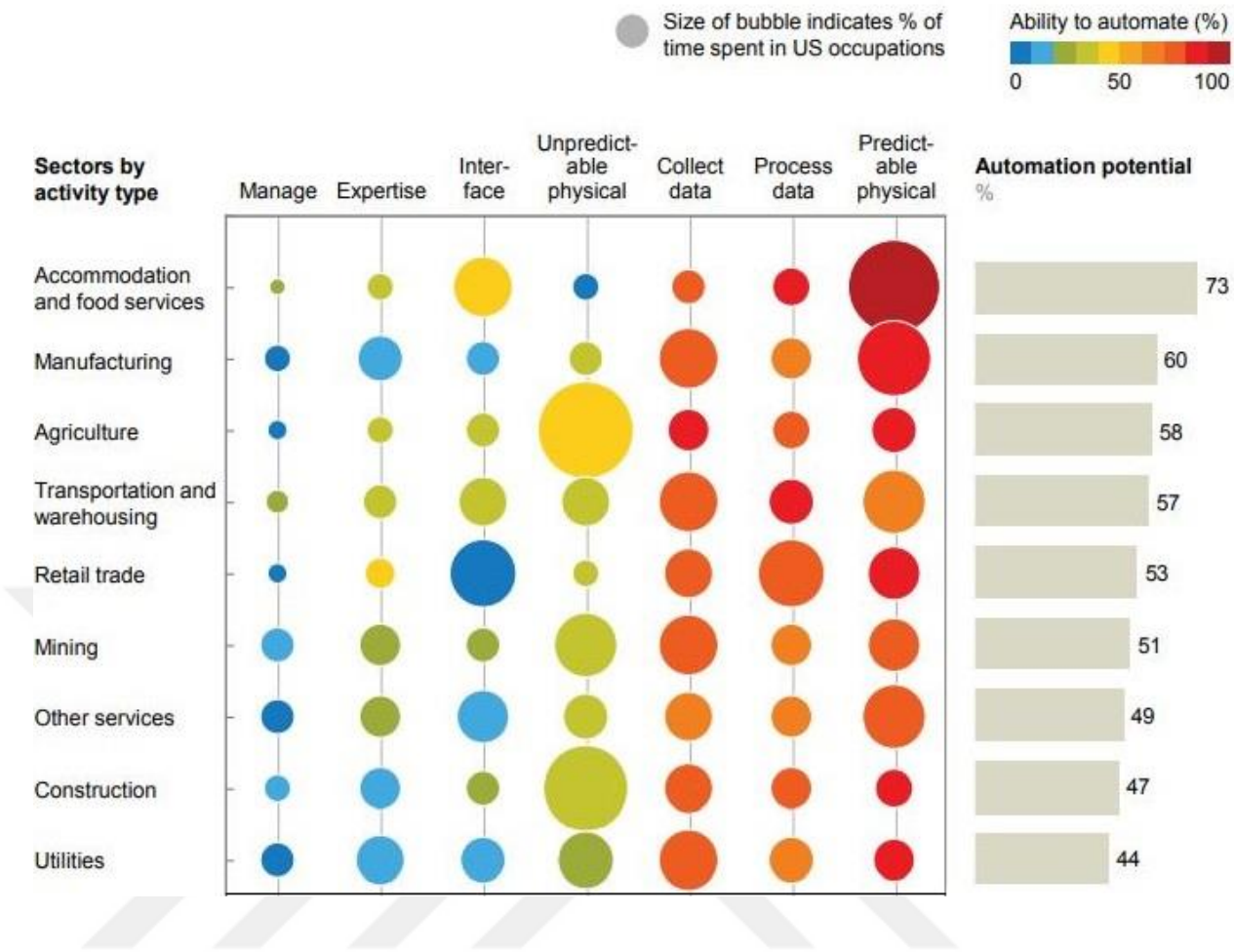



Figure 10. The technical potential for automation across sectors varies depending on the mix of activity types (Soruce: PricewaterhouseCooper, 2018)

Robots, Artificial Intelligence and Service Automation (RAISA) can address some main challenges for the hospitality industry. Challenges such as labor shortage, an increase of non-English speaker international travelers and a large volume of customer's data are few of them (Bowen & Morosan, 2018). Especially the shortage of qualified workforce and a high rate of employee turnover of the hospitality sector is becoming a critical issue for some countries (Kuo et al., 2017; Mathath & Fernando, 2017). For example, It is estimated that there will be a shortage of 60,000 workforce a year for the hospitality sector in UK only if restriction for immigration is too tight due to Brexit (The impending withdraw of the United Kingdom from the European Union) (Kamal, 2017). It is predicted that by 2030, companies that effectively adopt

and implement RAISA into their businesses will have a competitive advantage over those who did not (Bowen & Morosan, 2018).

#### 2.4.1.1 Benefit and Shortcomings of RAISA

Applying RAISA has its benefits and costs like any other technology. Mathath & Fernando (2017), mention benefits of robots for the food industry in minimizing errors, increasing efficiency, reducing capital costs, increasing productivity, reducing operational cost, improving product quality and consistency, increasing accuracy, increasing flexibility, reducing labor turnover and higher repeatability (Mathath & Fernando, 2017: 288-291).

Costs and benefits can be both financial and non-financial for applying RAISA in the hospitality industry (Ivanov & Webster, 2017). The most important financial benefits of RAISA is the labor cost saving that resulted by using 24/7 service robots, chatbots and self-service kiosk instead of human employees. In addition to that, chatbots can provide services for multiple customers at the same time, which is not possible with the traditional way. Adopting these technologies does not necessarily mean to eliminate human forces but rather enhancing employees with their tasks and improving productivity. Robots and artificial intelligence can also have a positive contribution to sales due to being interesting and unique for some customers especially in the early stage of adaptation of technology in the sector.

Main non-financial benefits of applying RAISA is enhancing the perceived service quality through unique methods of servicing, communicating and engaging customers. For example, the limited scope of languages by staff can be eliminated easily by applying RAISA and communicating through multiple languages with customers is easily feasible inside the business. RAISA can also create value for customers by providing service in a fun and entertaining way. Furthermore, RAISA would solve the problem of sectoral employee turnover and eliminate any law related

problem with hiring and firing staff (Ivanov & Webster, 2017).

On the other hand, there are financial and non-financial costs for adopting RAISA in the hospitality industry. Financial expenses include the cost for acquisition, installation, maintenance, software update, staff training or hiring specialist and costs for adapting the environment to facilitate robot's mobility. There can also be non-financial cost related to the resistance of employees for adopting RAISA into their work environment. Adopting any types of new technology into business need reengineering of the processes inside the organization. This may include training staff to use new technology and redefining operations manual for them, which may push some people out of their comfort zone. Furthermore, employees may consider new technology as a threat to their jobs. Resisting to adopt new technology can also extend to customers as well. Some people might feel uncomfortable and unsure on how to use new technology or they may just prefer the touch of human rather than high tech device for providing service for them (Ivanov & Webster, 2017). In other words, acceptance of customers and employees are two determining factors for the success of new technology into the business. Even if financial calculation for adopting new technology is favorable, managers still need to consider customers and employees and understand their perception for adopting new technology (Dixon et al., 2009; Kimes, 2008).

#### 2.4.1.2 Examples of Chef Robots

Although the concept of using Artificial Intelligence (AI) in the kitchen may sound like a very new topic, in fact, the first prototype was designed more than a decade ago (Hashimoto et al., 2008). Kyoto University in Tokyo with the help of National Institute of Information and Communications Technology of Japan designed and built a smart kitchen where AI observe and learn the process of cooking with the help of smart sensors, motion detector cameras and thermal cameras (Hashimoto et al., 2008).

Figure 11. The world's first robotic kitchen created by Moley Company

A British company by the name of Moley Robotic perfected this idea by combining it with perfectly designed robotic arms and created the world's first fully automated and intelligent cooking robot in 2015 (Figure 11). Their robot can learn up to 2,000 recipes and mimic the motion of chef human with the help of 20 motors and 130 sensors (Gibson, 2015).

Figure 12. Spyce, a robotic restaurant in Boston, USA

The above-mentioned robots are specially designed for the household task and not suitable for restaurants and businesses. Robotic technology and robot chefs come in a variety of types for the restaurant industry. Perhaps the most successful and recent one is by the name of Spyce, which was founded by four MIT graduate students

(Holey, 2017). Spyce currently runs a Boston restaurant that relies on seven autonomous cooking pot that rotates and prepares freshly made dishes for customers (Figure 12). As of March 2018, Spyce is capable of preparing seven different bowls from seven different parts of the world. Each bowl takes 3 minutes or less to prepare and cost just 7.5$ (Spyce, 2017).


Figure 13. Flippy, The world first autonomous robotic kitchen assistance by MISO robotics

The world first autonomous robotic kitchen assistance by the name of Flippy gained media attention since it started his job at the Caliburger restaurant in Los Angles (Godwin, 2018; Graham, 2018; Holey, 2017). Flippy is a robotic arm with Artificial Intelligence (AI) that is made by MISO robotics (Figure 13). It is designed specifically for use in the commercial kitchen and fast-food restaurants. This robotic arm is capable of making burgers up to 1,000 a day according to David Zito, CEO of Miso Robotics (Bandoim, 2018; Graham, 2018). It has different arms/tools for flipping the meat, removing cooked meat from the heat and cleaning the grill for after cooking. Flippy is food-safe device and it is equipped with laser sensors that allow staff to collaborate with Flippy safely. Moreover, it has 3D and thermal scanners for eyes and

manufacturer-cloud-connected AI for the brain (Bandoim, 2018). The cloud-connected artificial intelligence of Flippy enables it to learn from its surroundings and learn new skills over time. CaliBurger plans to expand Flippy to more than 50 of its franchises throughout worldwide by the end of 2019 (Owano, 2017).

#### 2.4.1.3 Examples of Waiter Robots

Deploying robotic technologies and automation for the front of the house in a restaurant means less waiter/waiters for delivering orders to the customers (Asif, Sabeel, Rahman, & Khan, 2015). Many think that the digital technologies may just assist the waiter for taking and transferring orders to the kitchen. However, it may not be too long before the elimination of the waiter at first place for taking orders. Successful example for this idea is the Baggers Restaurant in Germany (Pantelidis, 2009) which use the clever engineering that relies on gravity for the delivery of food and drinks on the table (Figure 14).

Figure 14. Baggers Restaurant in Nürnberg, Germany

Exactly same concept is applying in nine branches of Rollercoaster Restaurants in Europe and the Middle East (http://www.rollercoasterrestaurant.com). These restaurants operate with no waiter for delivering orders and customers can place their order through tablets that are handed to them. These tablets are integrated with the POS system and Kitchen Display System of the restaurant for real-time communication between FOH and BOH. Moreover, details information about menu items and their nutritional facts are provided for customers through the same device. Customers just place their orders through those tablets and after a while, their food or drinks slide spirally from the upper floor (kitchen of the restaurant) to their table (Alton Towers, 2016).

Using robots in the environment of restaurants are becoming more common as robotic technology advance each day. Social service robots are the type of robots that can do the jobs of a servant in the restaurant (Weiss et al., 2016). According to IFR (International Federation of Robotics), a service robot is a robot that automatically provides useful services for humans or other machines, excluding manufacturing operations (https://www.ifr.org/service-robots/). Social robots are those that are designed to communicate and interact with humans and are capable of understanding the social term (Asif et al., 2015).

The first restaurant that used robots for delivering its food to customers was a Chinese restaurant in Pasadena, California in 1983. Those robot waiters were huge in size and were not practical due to the low level of robotic technology of that time (Davis, 2012). Nowadays, there are several restaurants and cafes around the world that use robots for not only delivering orders to customers but also for entertainment (Mathath & Fernando, 2017; Weiss et al., 2016). Hajime is a Japanese robotic restaurant with a samurai theme that is located in Bangkok, Thailand. Customers place their orders through a user-friendly touch screen that is installed in front of them and a legless robot that dressed as a samurai wheels down to the kitchen and delivers orders when they are ready (Weiss et al., 2016). For safety reasons, the restaurant is designed

in a way that no customers can be in the path of the robot and only through windows they can pick their delivered dishes (Figure 15, right).


Figure 15. FU-RO the waiter robot (left) & Hajime restaurant in Bangkok, Thailand (right)

Another great example for waiter robot is FU-RO restaurant robot that is produced by South Korean Robotics Company by the name of Future Robot Co. Ltd. This practical restaurant robot is specially designed for restaurants such that it can be integrated with POS and other operating of the restaurant (Figure 15, left). Customers and waiter robot can easily interact with each other through specially designed HRI (Human-Robot Interaction) service technology by the company. With the help of FU-RO customers can access to menu, order and even pay with their bank or credit card (Weiss et al., 2016).

Figure 16. Ada, the Turkish waiter robot in cafe Cadde Meram in Konya, Turkey

The Turkish example for using the robot as a waiter is Cadde Meram cafe in Konya, Turkey. This place is not only a cafe but also a robotic application center for Software Engineering Company by the name Akinsoft. The robot by the name of "Ada" is serving humans by delivering orders and greeting customers in the cafe for the first time in Turkey (Figure 16) (Anadolu Ajansi, 2015). This robot is 150 cm long and weight around 30 kg. There are special paths for robots in the restaurant in order to move and provide services for tables without any accident (Akinsoft, 2018).

Anthropomorphism is an important concept that needs to be taken into consideration for using waiter robots in a restaurant or in the hospitality sector in general. Human responds and likeness toward robots is not linear and can change dramatically according to robot autonomy, capabilities and anthropomorphic differences (Murphy, Gretzel, & Hofacker, 2017). This idea is known as The Uncanny Valley and it first brought up by Masahiro Mori, a robotics professor at the Tokyo Institute of Technology in 1970. Mori observed that as robots become more and more humanlike, people start to feel more comfortable around them until some certain point (Figure 17). Some people start repulsing robots and feeling uncomfortable after that point but the relation becomes positive again as the robots look more like healthy

humans (Mori, 2012). In other words, the degree of how robots move, act and resemble human can affect acceptance, affective reaction, and loyalty of customers toward the waiter robot (Murphy et al., 2017).

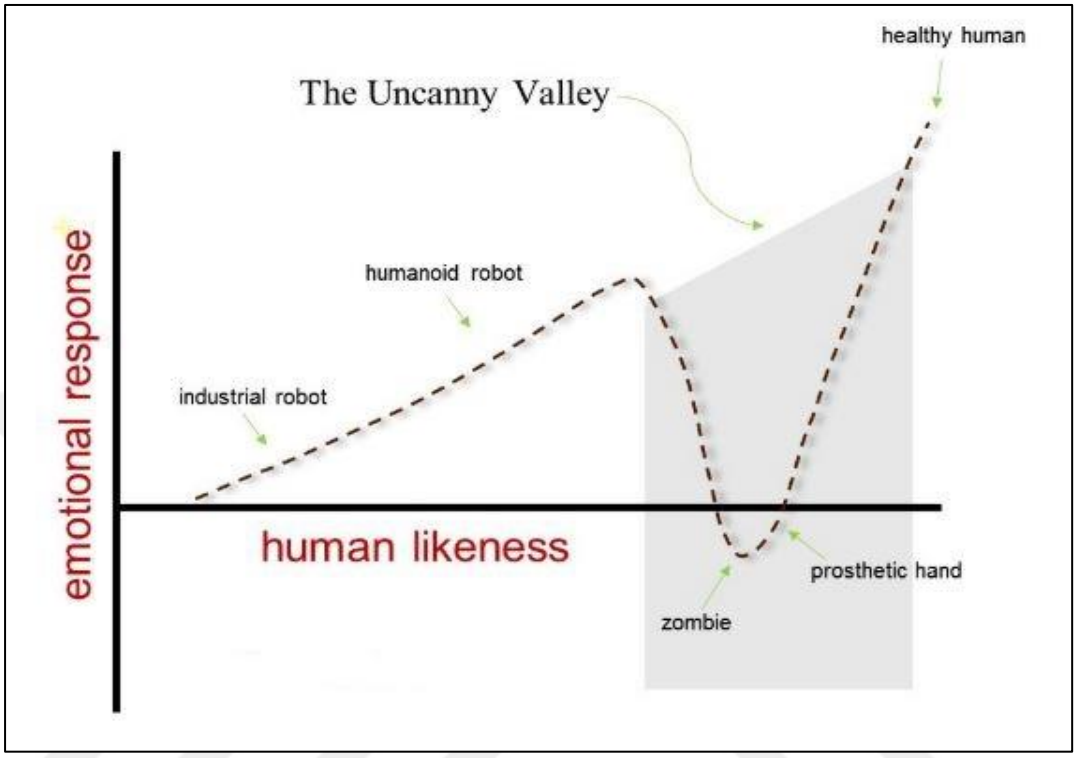



Figure 17. The Uncanny Valley by Mori in 1970

### 2.4.2 Back of the House (BOH)

Back of the house or back-office are areas that relate with purchasing, receiving, storage, food preparation, service, dishwashing area, sanitation, accounting, budgeting and control (Meyer & Vann, 2013: 152). Similarly, BOH technology consists of product management systems for purchasing, managing inventories, menu management, controlling labor costs and kitchen display systems. Most of these systems and applications come in the form of software programs that allow operators to be up to date and have accurate information for better decision making (Walker, 2010: 392). According to the American Hotel & Lodging Association (AH & AL),

BOH computer-based systems include labor management and scheduling, inventory/purchasing management, menu analysis and business intelligence/ data analysis (AH&AL, 2006). Kitchen Display System (KDS), Smart Oil Management and Customer Relationship Management (CRM) system are types of technologies which are further discussed in the following sections.

#### 2.4.2.1 Kitchen Display System

Kitchen Display System (KDS) enable kitchen staff to manage and control kitchen efficiency smoothly with the help of highly real-time and visible information that the system provides for them. This system is usually applied for quick service and high volume restaurants in order to expedite preparations and tracking of orders (Demicco et al., 2013: 130). Typical kitchen display system consists of four main components; the controller (receive, manage and control orders), the monitor (provide clear, legible and informative display for staff in kitchen), the bump bar (allow kitchen staff to manage order manually) and software (run the system and integrate with POS) (Cavusoglu, 2015).

Kitchen Display System (KDS), sometimes referred to as a video monitor, has a variety of features and applications in the back of the house. This system can be installed with specified priority such as preparation time. The chef can set a preparation time for items on the menu and when an order takes longer time than the limit, the color of the order changes in the display screen of the kitchen. If it takes significantly more time to prepare an item than it should, the item in the screen blink and manager is paged to take action. In addition, kitchen staff can customized display screen to remind them on important notes (e.g., “No salt”) or set various colors for certain types of dishes (e.g., blue for cold food) (Demicco et al., 2013: 130). Another useful feature is that the displays monitor can remind important notes for staff and even play videos and display the image of the ordered dish. Watching a video about how to prepare a menu item in KDS will ensure that the menu items prepared in the kitchen will be

consistent. Even new kitchen staff can prepare the items based on the standard operating procedures (Walker, 2010: 396).

Kitchen Display System (KDS) can be integrated with the handheld ordering system and restaurant's PDA (Personal Device Assistance) devices that result in real-time communication for the waiter with kitchen. This technology speed up kitchen performance, remove reheats, reduce labor cost and enhance guest rapport (Walker, 2010: 395-396). Businesses applying such technology report reduction in food spoilage and production time and at the same time increase in the kitchen volume and table turn over. Moreover, this system helps restaurants to identify their bottlenecks with the help of reports and statics that they provide. It develops better control over in the kitchen while it assists managers to increase their control of consistency for both preparation and delivery (Kimes, 2008).

#### 2.4.2.1 Smart Oil Management System

Changing the fryer oil in the restaurant is a risky task by its nature and how and when it needed to be changed is crucial for the quality of the food. More than half of burning accidents in the foodservice industry are related to hot grease and the foodservice industry pays more than 2 billion US dollar every year for such slip-and-fall injuries (Ojha, 2018). Smart Oil Management System attack this challenge in an intellectual way such that it improves employee safety, restaurant cleanliness and reduce costs for the business (Frontline, n.d.). This system comes in the form of Portable Restaurant Cooking Oil Shuttle Systems and Fryer Oil Filtration Systems (Figure 18).

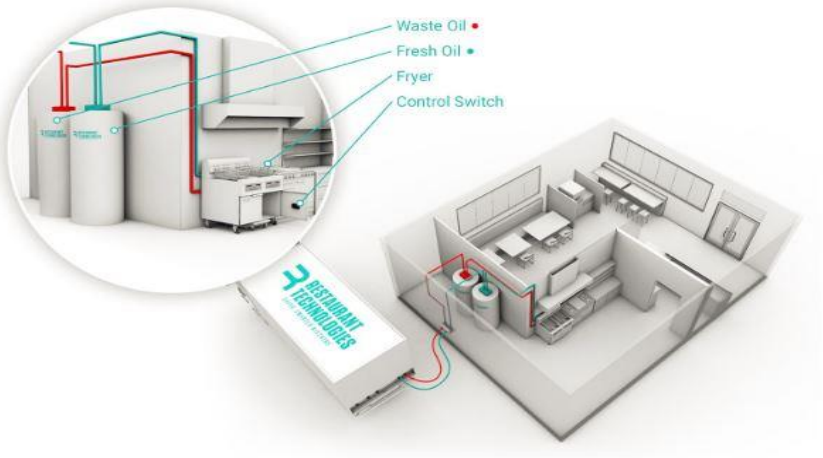



Figure 18. Typical Smart Oil Management System

Smart Oil Management System allow employees to empty the oil tank of the fryer by just a touch of a button. The waste oil travels from fryer to containment tank totally hands-free and fully automatic (Beach, 2015). Such a smart solution operates in an integrated platform where special designed sensors and equipment are interconnected by the Iot that allow full control for oil management in a restaurant. Some of the companies that provide such technological solution for restaurants also offer unique features such as web-based software that allow managers a dashboard for tracking oil usage, standardizing filtration, scheduling pickups, measuring diagnostics from anywhere (Frontline, n.d.)

#### 2.4.2.1 Customer Relationship Management (CRM) Systems

Attracting a new customer for a restaurant has much higher expenses than retaining the existing one for a restaurant. Moreover, there is 60% more chance for a customer who has already made a purchase to repurchase in the same business. This two fact alone should bring the attention of foodservice business owners/managers for making customer retention one of their valuable investment for long-term strategies (McCormick, 2018). CRM can appear in various forms and versions but the main object is to create and maintain customer loyalty while increasing the revenue of the

business (Demicco et al., 2013: 136).

Customer relationship management is not a new concept for restaurants and cafes. Frequent dining programs, loyalty programs, and gift cards are typical examples of CRM. However, the capacity to integrate and combine all components for providing an effective CRM system is a recent phenomena. Modern restaurant operators can approach to customer's database thought in so many innovative ways. As a result, operators can provide an effective CRM system that best suit the business and also create a bond with customers for the long run (Walker, 2010: 411). Integrated CRM system solutions with POS system of the restaurant can save the contact information of customers such as email addresses, phone number, important dates (e.g., birthdays, anniversaries), and preferences. With the help of such valuable information, CRM can provide unique and special designed loyalty programs for each individual according to their preferences and history of their activates in the restaurants. For example, there are integrated CRM that can produce slips according to customer information and previous activities in the restaurant. With the help of these slips, servants can welcome guest by their name and greeted them with their favorite drink or appetizer. Moreover, the servant can suggest dishes according to recorded past preferences, dietary restrictions and historical data. Such interaction with customers creates a home friendly environment for people who visit the place more often. (Demicco et al., 2013: 135).

### 2.4.3 Front of the House (FOH)

Any operation related to customers in the dining areas such as taking orders, delivering food and completing payment belongs to the front of the house (Walker, 2010). The main technology that relates to the front of the house is Self-Service Technologies (SST). In this section, various form of SST such as tabletop technology, digital display menu and, kiosks will be discussed in the following sections.

#### 2.4.3.1 Self-Service Technology (SST)

The concept of Self-Service Technology (SST) is not a new idea and has existed for a long period of time in different sectors such as banking (ATMs) or check-in and check-outs at hotels (Torabi Farsani, Sadeghi, Shafiei, & Shahzamani Sichani, 2016). In general, SST enables customers to consume different benefits and services on their own, independent of the involvement of an employee at a company. For the case of restaurants, SST can be explained as involving the customer as a participant in the production of the guest experience (Ford, Heaton, & Brown, 2001).

Self-Service Technology can appear in a variety of forms such as assisting in producing a product (i.e. salad bars and self-service beverage stations), marketing (i.e. sharing stories of positive experience), and supplying the organization with beneficial information (i.e. purchase records and feedbacks) (Kincaid & Baloglu, 2008). Allowing the customer to participate in the service experience can be substantial. The greatest benefit of it is cost reduction since customers replace labor that the organization would have to pay to perform otherwise (Meuter, Ostrom, Roundtree, & Bitner, 2000).

Even if the financial benefit of SST ignored, there are still some important advantages of using SST for the businesses. First, more involvement of the customers to provide service for themselves means the more likely that the experience is more pleasant for them and would meet their expectations. Second, anything customers do for themselves, the organization does not have done for them, that means less cost and effort for the organization. A third and most important one is that organizations may achieve the loyalty of their customers since they are participating somehow in a task and may see themselves as part of the “family/team” (Ford et al., 2001)

#### 2.4.3.1.1 Digital Display Menu

The recent Self-Service Technology for restaurants that gained so much attention is replacing their printed menu with digital display menu. This SST solution comes in various forms and versions (Figure 19). They may be installed as a part of the table itself or just provided as a mobile tablet for customers (Saeid & Macanovic, 2017). Moreover, the spread of smartphones pushed companies to develop a mobile application for business so that customers access to their menu through their personal phone and even order from there. Studies show that usage of such SST in a restaurant has a significant impact on customer experience and satisfaction (Hsu, District, & City, 2013; Kincaid & Baloglu, 2008). The finding indicates that the most frequently liked features of such SST were a convenience, easy to use, and fast service (Kincaid & Baloglu, 2008). Moreover, at least one study suggests that using iPad for a menu in restaurant significantly affected the perceived value for customers in both functional factors (i.e. better control, ease of use, and usefulness) and emotional factors(i.e. perceived enjoyment and novelty) (Wang & Wu, 2014).


Figure 19. Various versions of E-Menu

Using digital display menu allows customers to order food and drinks along with providing enormous information in an easy way for the customer without interaction with employees. For example, menu descriptions may include nutritional

information, preparation specifications, zoomable HD pictures with taste notes, and preparation video of the product (Wang, 2012). Moreover, customers can also search through the menu for what they have in their mind by typing the name of a specific dish/drink or their favorite ingredient and see available options. In addition to that, such a menu can suggest the best food pairing drinks like wine options according to selected items. This technology can also monitor the stock level of the business and removed items that are sold out from the menu automatically (Wang & Wu, 2014). Finally, servers will be able to provide better service to a greater number of tables when they are no longer busy with the responsibility of taking the order and handling it to the kitchen (Kincaid & Baloglu, 2008).

#### 2.4.3.1.2 Tabletop Technology

Tabletop technology is another form of SST that make ordering a unique experience for the customer in a restaurant. Same as E-menu they come in a variety of forms. They can appear as a multitouch interface that allows the customer to access services that the business provides for them (Chen, 2012). In the more advanced version, they appear as a holographic interface that detects asked action by hand motion of the user (Figure 20). Usage of such SST solution not only makes boring task such as ordering and waiting as a fun experience for customers, but also can significantly affect dining time, table turnover and labor for a restaurant (Wang, 2012). Just as an example, a restaurant that used proper tabletop devices in their environment and allowed customers to whether to just order or order and pay through their SST solutions, dropped the dining time of their guest by 17% and 31% respectively (Susskind & Curry, 2018).

For example, a restaurant in London by name of Inamo applies this idea by use of tabletop technology. Customers in this futuristic restaurant can access to the menu and order without waiter just by their hand motion and use of mouse trackpad (Figure 21). Extra details of food and drink with the holographic illustration of the selected item appears into the plate of diners and after placing the order they may watch the preparation procedure live from the installed camera in the kitchen or bar.

In addition to that, diners may select their desired theme of their holographic tablecloth and play some board games such as battleships (Sergioatinamo, 2009; Spence & Piqueras-Fiszman, 2014)

Figure 20. Holographic types of tabletop technology


Figure 21. Tabletop Technology at Inamo restaurant in London, U.K

#### 2.4.3.1.3 Self-Service Kiosks

Kiosks are one of the most widely used SST in the foodservice industry especially among quick-service restaurants (Rastegar, 2018). These self-service machines have a big touch screen that allows customers to interact with them (Figure 22). Kiosks started out by simple display machines and they developed over time and with advancement in digital technology. Nowadays, self-service kiosks are capable of

providing sophisticated services for customers. Check in and out process, purchasing, market research and ordering are just few examples of them.


Figure 22. McDonald's Self-service Ordering Kiosk

Restaurants use these machines for customers to place and pay for their food and drinks while they have the ability to customize their order. Using such SST can bring many advantages for the business. Reducing labor cost (Ford et al., 2001), improving the speed of service (Kincaid & Baloglu, 2008), increasing the accuracy of orders (Kincaid & Baloglu, 2008) are the most important values that can be achieved by adopting such technology. In addition to those, self-service kiosks can increase sales due to upselling by always asking customers for additional items on their orders which can be forgotten by a normal employee during taking orders. For example, president of Wow Bao franchise (Quick service Asian restaurant) reported that self-service kiosks increased the average check amount of the business from 90 cent to 1.5 $ just due to upsell feature of kiosks (NRA, 2016). Moreover, studies show that people are avoiding purchasing complex menu items and items that have higher calories in front of others (Strauss, 2015). Meanwhile, adopting self-service kiosk can attract millennial customers and their younger counterparts to the business (Cross, 2017).

## 2.5 Previous Studies about Technology Adaptation among Restaurateurs and Customers

On this section, we look at a few similar studies that were conducted by both academics and experts on this field. The first study was related to the measurement of satisfaction with technology and innovation among both customers and restaurant managers (which is related to the second and third objectives of this research) in the city of Isfahan in Iran. (Torabi Farsani et al., 2016). The interest level of 380 customers about using certain types of innovations and technologies in restaurants were asked in the form of questionnaires. For example, customers were asked about ordering food through E-menu or E-table or using mobile application for ordering and booking service. Detailed information about these questions and the obtained results are illustrated in the below Table 4.

Table 4. Descriptive Analysis of Consumer Behavior Variables in Restaurants

| Variables | Frequency (Scale) | | | | | |
|---|---|---|---|---|---|---|
| | Very low | Low | Medium | High | Very high | Missing |
| Question 1:Are you interested in being served your food in an "electronic restaurant" (a restaurant which applies information and communication technology (ICT) in the food service industry)? | 43<br>11.3% | 40<br>10.5% | 107<br>28.1% | 105<br>27.6% | 84<br>22% | 2<br>0.5 |
| Question 2: Are you interested in using an SMS text messaging service in restaurants? | 34<br>8.9% | 35<br>9.2% | 66<br>17.3% | 101<br>26.5% | 145<br>38.1% | 0<br>0 |
| Question 3: Are you interested in ordering foods through an E-menu or E-table in restaurants? | 25<br>6.6% | 29<br>7.6% | 50<br>13.1% | 127<br>33.3% | 150<br>39.4% | 0<br>0 |
| Question 4: Are you interested in using a restaurant booking service on your mobile phone? (a software which included a map with all restaurants) | 13<br>3.4% | 9<br>2.4% | 41<br>10.8% | 94<br>24.7% | 224<br>58.8% | 0<br>0 |
| Question 5:Are you interested in using restaurants with an E-healthy menu? | 22<br>5.8% | 15<br>3.9% | 54<br>14.2% | 99<br>26% | 191<br>50.1% | 0<br>0 |
| Question 6: Are you interested in innovation in restaurants? | 7<br>1.8% | 0<br>0% | 42<br>11% | 98<br>25.7% | 229<br>60.1% | 5<br>1.3 |

*Notes*. SMS: short messaging service.

Results of the research indicate that the most favorite technology from the customers' perspective is using their mobile phone for booking a service. Using E-menu or E-table and using an SMS (short messaging service) text messaging service were second

and third most liked technology for using in restaurant respectively. Moreover, one of the finding of the study indicates that women, in general, are more interested in using the mentioned technologies in restaurants. (Torabi Farsani et al., 2016). In the same research, opinion and attitude of 19 restaurant managers about applying ICT (Information and Communication Technology) in their businesses were also asked. The obtained result indicates that 90% of participants were interested in the application of ICT in their restaurant. Table 5 illustrated these results in more detail.

Table 5. Descriptive Analysis of Restaurant Managers' Attitude to Applying ICT in their Restaurants in the Future

| Variables | Frequency (scale) | | | | | |
|---|---|---|---|---|---|---|
| | Very low | Low | Medium | High | Very high | Missing |
| Are you interested in using an e-menu in your restaurant in the future? | 1<br>5.3% | 1<br>5.3% | 0<br>0% | 8<br>42.1% | 8<br>42.1% | 1<br>5.3% |
| Are you interested in using an SMS text messaging service in your restaurant in the future? | 0<br>0% | 5<br>26.3% | 2<br>10.5% | 3<br>15.8% | 8<br>42.1% | 1<br>5.3% |
| Are you interested in designing e-tables for your restaurant in the future? | 1<br>5.3% | 0<br>0% | 1<br>5.3% | 4<br>21.2% | 12<br>63.2% | 1<br>5.3% |
| Are you interested in investing in the design of an e-healthy menu for your restaurant future? | 0<br>0% | 4<br>21.1% | 0<br>0% | 5<br>26.3% | 9<br>47.4% | 1<br>5.3% |

Another similar study related to the second objective of this research was undertaken by METRO GROUP, one of the world's leading retail and wholesale companies (Meier, Guigou, Vetterli, & Millar, 2017). This research aimed to measure technology adoption and implementation barriers among independent restaurants in four European countries (Italy, Germany, Spain, and, France) and Japan. The participants, consists of 3405 of METRO customers and 365 non-METRO customers and they included owners, managers and/or chefs. 11 business process in a restaurant were defined and participants were questioned about the level of technology used, the importance of technology and, future investment intention on technology for each process. According to results, technology was slightly more important for the front of the house (FOH) over the back office processes from the perspectives of participants. The top three processes in the aspect of technology use and the importance of applying technology were for payment solutions, communication and finance processes.

Moreover, it was revealed that almost 40% of independent restaurants in Europe do not use technology to support their daily tasks while this amount is 67% for Japan (Figure 23). In Europe, 30% of restaurateurs use technology at a basic level (e.g. using Microsoft office programs for handling basic accounting or communicating via the internet). Germany and Spain had the highest rank in using technology.

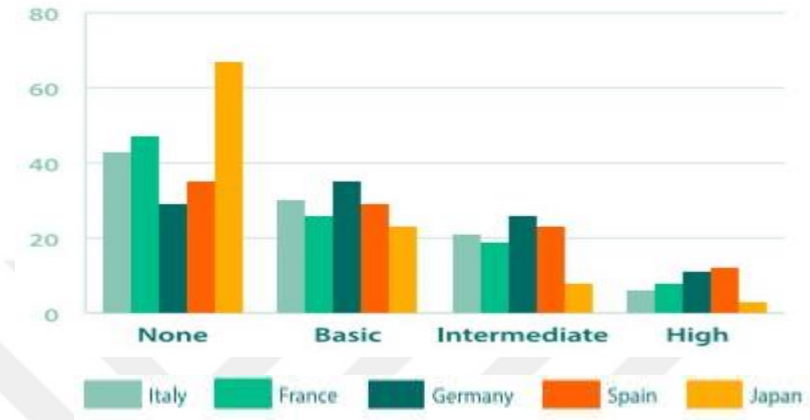



Figure 23. Level of technological use in Europe and Japan

In addition, most decision-makers in mentioned countries consider technology important to enhance business processes. According to the result, Germany ranks first in this topic among other countries. Most of the French and Italian respondents consider technology "Not important or "Somewhat important". The majority of Japanese independent restaurateurs mentioned that technology is not important for their business (Figure 24).

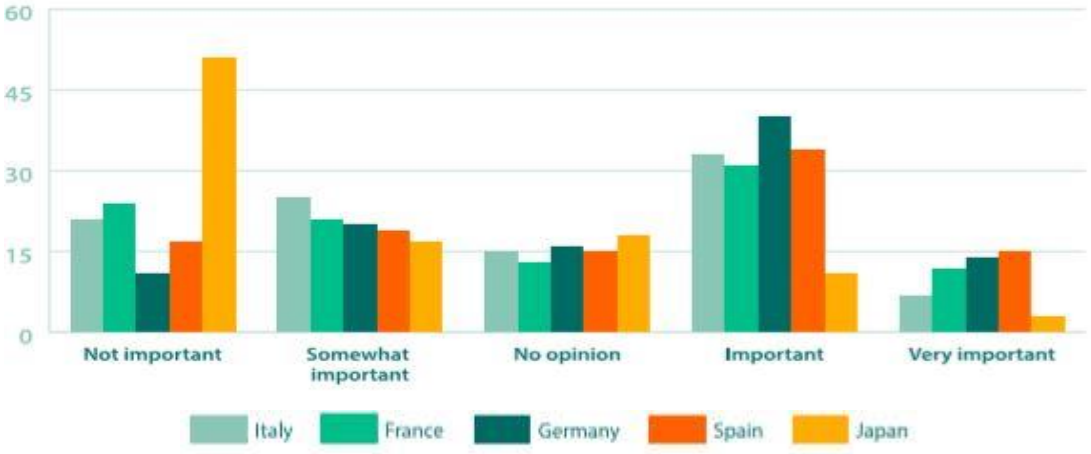



Figure 24. Importance of technology in Europe and Japan

Future intention for investment in technology and factors preventing restaurateurs were two other subjects that were assessed in the study. It was revealed that 85% of respondents had no intention to invest in technology for their businesses and similar barriers for adoption of technology were mentioned in the five countries. The three main factors were namely priority, cost and, strategy (Figure 25). Priority refers to the issue that technology is not a priority compared to other projects in a restaurant and strategy means that technology or implanting it into a business is not a part of the overall strategy of the decision maker. Below figure illustrate these technological adoption barriers of the study in more detail.

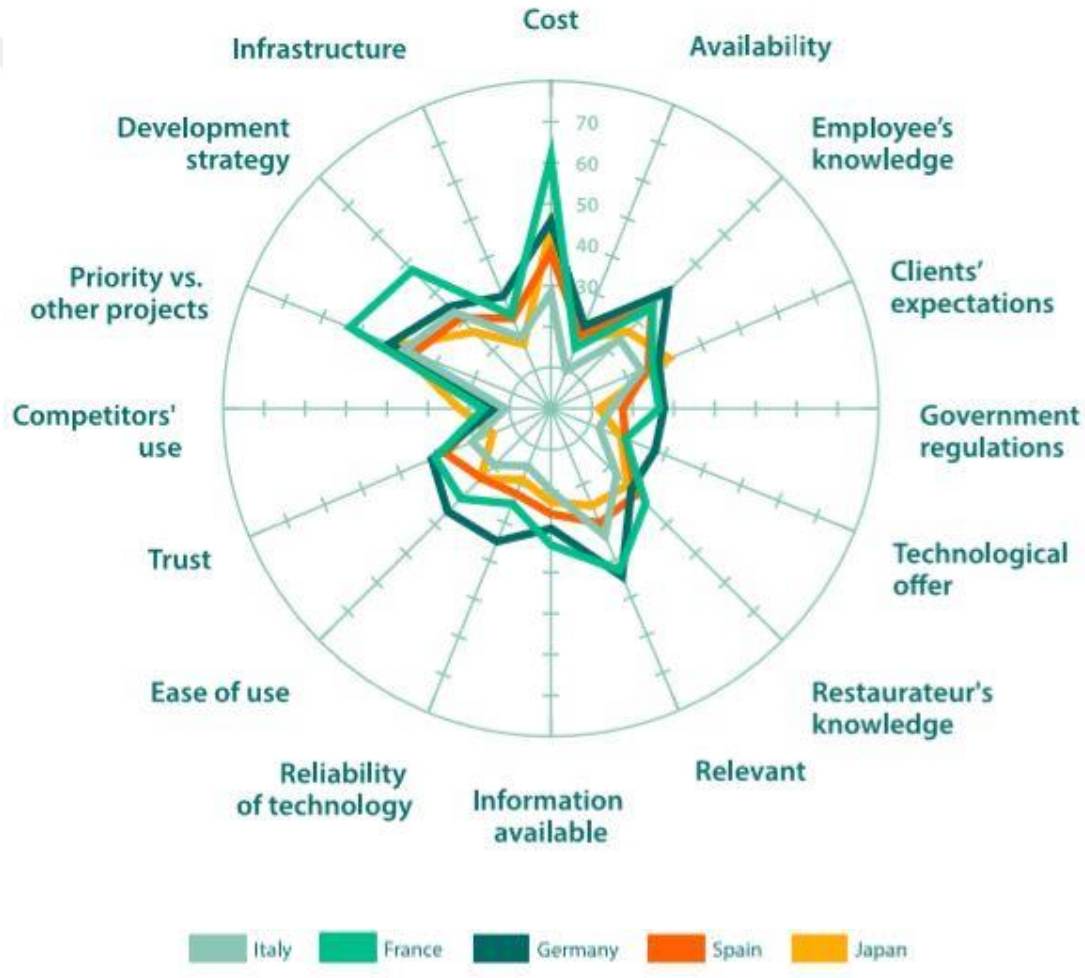



Figure 25. Factors preventing restaurant owners from adopting technologies in their restaurants

The final research related to the topic that worth mentioning is related to customer preferences for restaurant technology innovations (third objective of our research) done by Cornell University School of Hotel Administration (Dixon et al., 2009). This research conducted an online nationwide survey among restaurant visitors within the United States. In the survey, perception of 2,000 respondents was asked about eleven-restaurant technology as well as whether they use those technologies and values they give to them. These eleven technologies were categorized into five groups as menu-based, online-based, payment-based service innovation, kiosk and queuing technologies (Table 6).

Table 6. Restaurant technologies tested Service

| Service innovation category | Technology | Definition |
|---|---|---|
| Queue management | Pagers for table management<br>Handheld order taking while waiting in line | Alerts customers when their table is ready<br>Order taken while customers are in line and transmitted to the kitchen |
| Internet-based | Online reservations<br>Internet-based ordering | Make reservations online<br>Order online for pick-up or delivery |
| Menu-based | Virtual menus available tableside with nutritional information<br>Virtual menus online with nutritional information | Electronic menus that have nutritional information of the restaurant's menu<br>Online menu with nutritional information tableside |
| Kiosk | Kiosk-based payment<br>Kiosk-based food ordering | Payment using a touch screen terminal<br>Order taken on a touch screen terminal |
| Payment | Payment via SMS or text message<br>Payment via 'smart' card (RFID-enabled)<br>Payment via cell phone using NFC technology | Payment made using a cell phone<br>Payment made with a RFID enabled credit card<br>Payment made with a near fields communication (NFC) cell phone |

This research used the technique known as best-worst choice analyses and according to the result, the most highly used technologies were pagers (56%) and online reservations (32%) while cell-phone payment technologies were hardly used at all (Figure 26). It was also found that the younger participants were likely to have used more technologies over than the older ones. Moreover, the results of the research reveal that the most valuable technology among the eleven technologies was the "tableside menus" with nutritional information. Followed by "pagers", "handheld order taking", "online reservation", "virtual menu", and "kiosk technologies". Values given by customer for each technology is also illustrated in Figure 27.

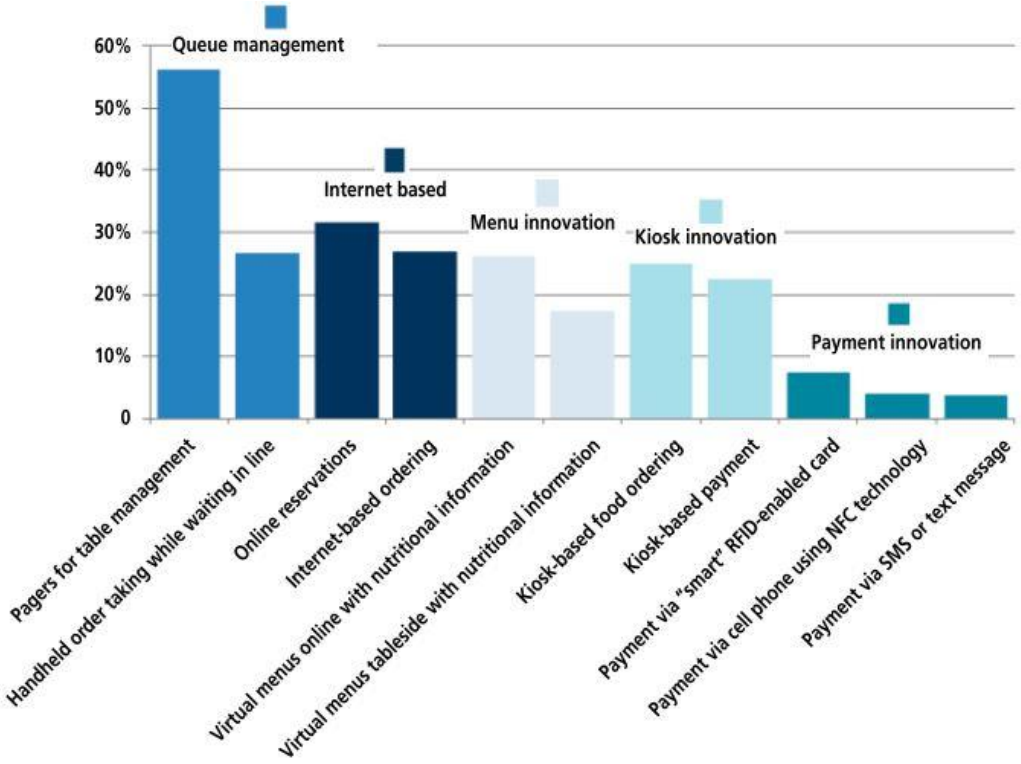



Figure 26. Technology use among respondents in percentage

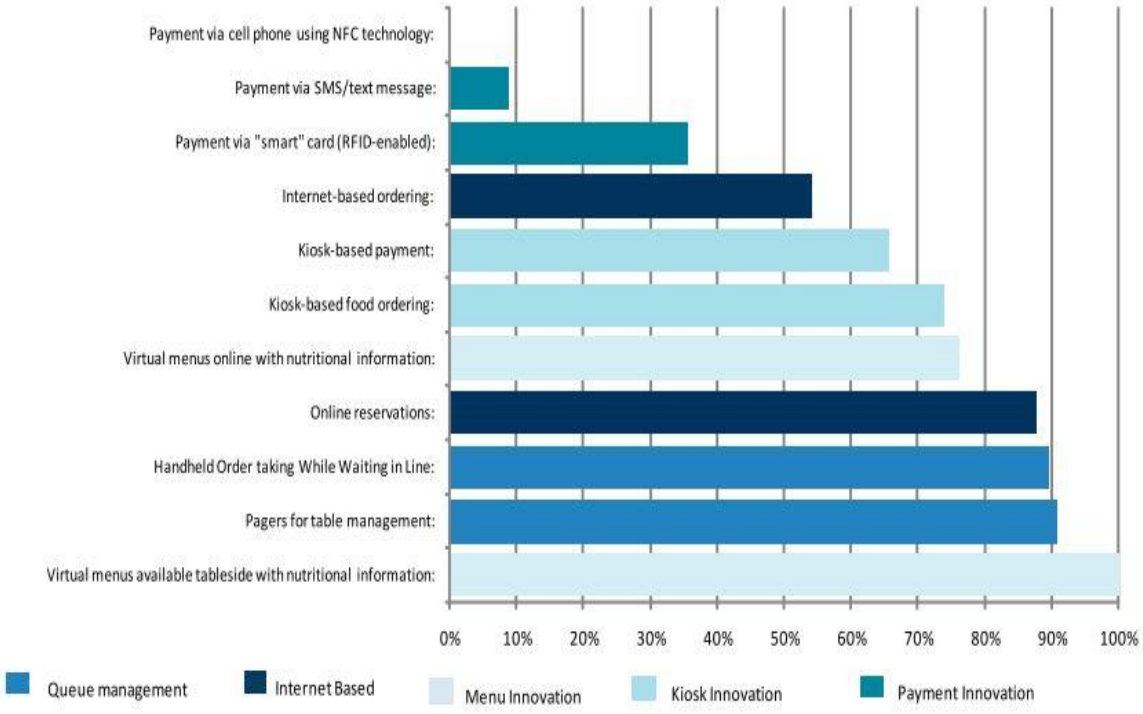



Figure 27. Respondents' value assessment of restaurant technologies

# CHAPTER THREE

# METHODOLOGY

## 3.1 Research Design

This study aims to assess the current situation of technological solutions for the foodservice industry in Ankara. In order to achieve this goal, three objectives were defined. Each objective considered as a different field and discussed separately. Although these fields are separate, they are interconnected and dependent on one another at the same time. Data was collected and analyzed for each field. The first objective was to gather information about available technological solutions, existing barriers for adaptation and future of them in the sector. To do so, quantitative approach in the form of two in-depth interviews with experts conducted with firms that provide various technological solutions and services for foodservice businesses in Ankara. These interviews were useful for not only gathering information from the field that generates technology for restaurants and cafes but also helped the researcher to learn more about the digital market used presently.

The second objective was to explore the Turkish restaurateurs and managers' mindset and learn their thoughts about applying technology into their businesses. In other words, we aimed to derive information from people that make the decision for purchasing and applying technological solutions in restaurants and cafes. In order to achieve this goal, 18 structured interviews were conducted with owners and managers of restaurants and cafes in Ankara. These interviews focused on current applied level of technology in the business, interesting topic for new technologies from participants' perspectives, barriers for adaptation of new technologies, digital marketing, interest level of interviewee toward certain types of technology such as robots and AI.

The third and final objective was to understand Turkish customers' expectations and preferences for encountering specific types of technologies in restaurants and cafes. For this, we designed a survey to find out the preferences of customers. Figure 28 demonstrate and summarize the road map of these three interconnected objectives for this study.

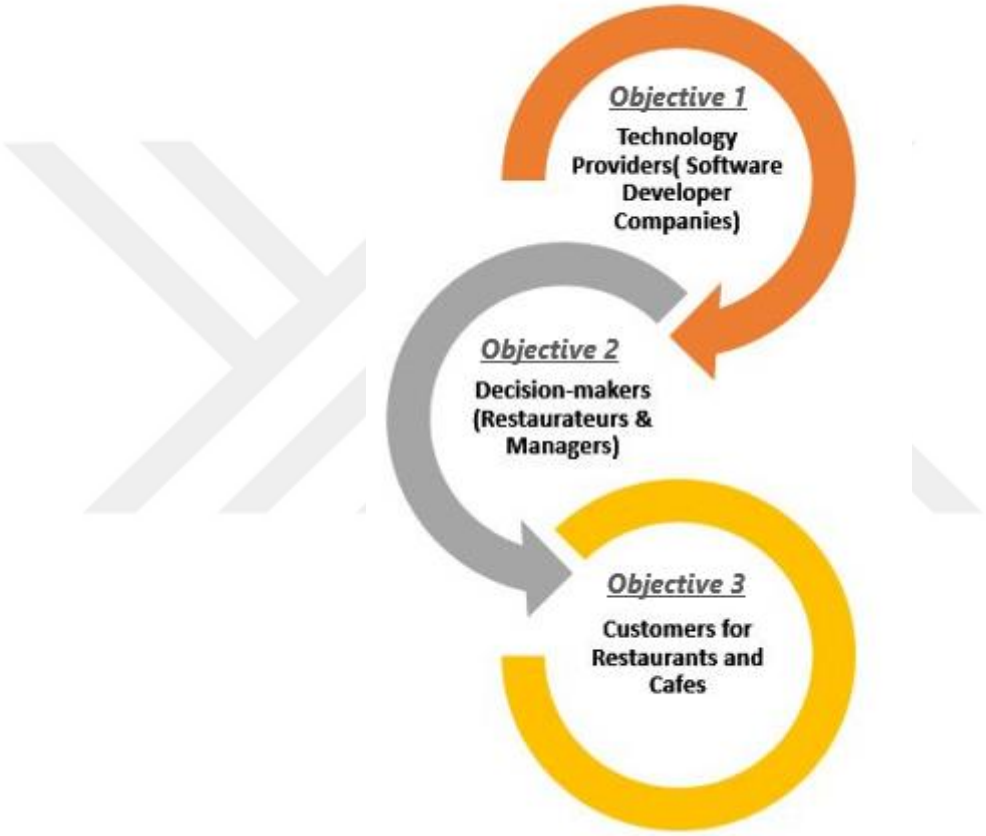



Figure 28. Road map and research design of the study

### 3.2 Research Strategy

In order to address each objective of this study properly, we decided to apply both qualitative and quantitative approach for the purpose of collecting data. The

qualitative approach in the form of in-depth interviews and structured interviews applied for first and second objectives respectively while quantitative approach applied by constructing a questionnaire. In-depth interviews focused on the current situation of the market, available solutions for existing challenges and, predicting the future of the sector in Turkey. Meantime, structured interviews with business owners and managers were focusing on technology adaptation and implementation barriers among restaurants and cafes in Turkey. Finally, 261 questionnaires collected from customers in restaurants and cafes in Ankara. They were asked to indicate their interest level toward certain types of technology that was discussed in the literature review of the study.

### 3.3 Data Collection

Data collection for this research had three stages that were related to three objectives of the study. Each conducted separately on different time. The first phase of data collection started with gathering information about places where technology born for the foodservice industry. This phase not only provided insight into the topic but also assisted the researcher for designing a questionnaire and survey for the second and third objectives of the research. First, an online search conducted by the researcher and a list of available companies in the city of Ankara discovered. There are different types of companies that provided a wide range of technological solutions for restaurants and cafes in Ankara. The first group of firms is innovators that create and provide software and hardware technological solutions for existing challenges in the sector. There are also retailers that just sell such technological solutions and provide after service for sold units. The first group, innovative type firms, was the concern for this study. Initial contact made with five candidate companies and only two firms replied and showed interest in participating in the research. As a result, we arranged a meeting and conducted both interviews in October of 2018. Interviews conducted in Turkish and voice of interviewees were recorded with interviewee's permission. Later each interview transcribed and summarized in English. Interviews were divided into

three parts. In the first part, we briefly explained the concept of this study and the main objective of it to interviewees. On the second part, questions related to the company itself and their products and services were asked. The last part of the interview focused on the impact of technology on the foodservice industry, existing challenges, and the future of the sector. One of the interviewed companies (Company A) was the biggest in the sector. The researcher had 55 minutes interview with Area Sale Executive of this company in their Ankara office. The second interviewed company (Company B) was a software programming company that provide specially designed products for restaurants and cafes. The researcher had 110 minutes interview with both the owner and co-founder of the company in their office in Ankara. Gathered information from conducted in-depth interviews summarized in Chapter four of this study.

The second phase of data collection was related to restaurateurs and managers and their thoughts about applying technology into their business. The main goal for this part was to explore the existing attitude and mindset of Turkish decision-makers in the foodservice industry toward technology. In addition to that, it was important to understand the challenges and barriers that avoid them from implementing technology into their businesses. In order to achieve these goals, we arranged 18 structured interviews with business owners and managers of restaurant and cafes in Ankara. Initially, interview questions with a set of options as potential answers were designed in English. Later, interview questions arranged in the format of a questionnaire and translated into Turkish (Appendix A). At the beginning of interviews, a brief introduction about the topic of study and some specific technological solutions, which were asked in the questionnaire, provided to interviewees. Moreover, we explained to interviewees that they can freely express their thoughts on the topic and the main aim of this questionnaire is to understand their mindset about a technological solution for the foodservice industry. Interviews took on average 20 minutes and during interview important and interesting topic were noted by the researcher and some of them were used later in this study. All interviews conducted in November and December of 2018 and completed within 5 weeks.

The final phase of collecting data was related to customers for restaurants and cafes. The end user of the most discussed technologies in this study are customers. The final evaluation for having such technologies that are in direct contact with customers will be done by customers, not managers or owners. As a result, it was crucial to know their expectation and preferences about facing technology solutions in restaurants and cafes. To do so, a survey was constructed to be filled by the end users in order to evaluate customer attitude toward certain types of technology in restaurants and cafes. Initially, survey questions prepared in English and later translated to Turkish for better understanding and accuracy of the result. The 5-point Unipolar Likert Scale was used for these types of questions in the survey meaning that there was no negative point on the scale. The level of confidence for this survey selected as 90% with 5% margin of error. In order to satisfy such standards, 262 respondents were needed as sample size if we assume the population of Ankara as 5,000,000 people. Initially, the data was gathered from a sample of 265 people, but four of questionnaires were removed for having too many missing answers. At the end, 261 valid ones were qualified to analyze. Face-to-face method used for distributing surveys among randomly selected people in Ankara. Crowded places such as shopping malls and universities' cafeterias during lunch times were selected as locations for distributing surveys.

### 3.4 Analysis of Data

All obtained data from second and third objectives analyzed with IBM SPSS Statics 25 software. For the purpose of clearer illustration, Microsoft Office Excel 2016 used for demonstrating graphs and figures. All obtained data and their detailed analysis are presented in the next chapter.

# CHAPTER FOUR

# RESEARCH FINDINGS

This chapter presents the findings of this research. The main research question was analyzed by the three objectives as discussed previously. Findings related to these three objectives should provide an insight into understanding the current situation of technology for the foodservice industry in Ankara.

## 4.1 In-depth Interviews with Technology Providers

Before presenting detailed information obtained from conducted interviews, it is necessary to state that the names of interviewed individuals and their companies were not openly mentioned due to ethical reasons. Moreover, some parts of the interviews were only used for enhancing the understanding of the researcher. Therefore, these parts were not included in the present text. Two conducted in-depth interviews with experts focused on three main questions.

1. What are the available technological solutions for restaurants and cafes in Turkey and what are their characteristics?
2. What are the existing and upcoming challenges for the development of technology in the foodservice industry in Turkey?
3. What are the future expectations for technology in the foodservice industry in Turkey?

### 4.1.1 Companies

Company A was a technological firm that provides services and technological solutions mainly for hotels and restaurants in Turkey since 1989. This company provides its service all over the country and have offices in five main cities of Turkey (Ankara, Antalya, Bursa, Izmir, and Istanbul) with more than 350 employees, which is the largest in the sector. This organization has the capability of providing technological solutions for almost all the main challenges of hotels and restaurants. Reservation systems, stock and inventory management, accounting, digital marketing, CRM (Customer Relation Management) systems, etc. are just a few of them. Their services include both software (programs, mobile application) and hardware (POS terminals, printers) types of equipment and with 24/7 call center, they provide flawless support for their customers. The researcher had 55 minutes interview with Area Sales Executive of this company in their Ankara office. The interviewee was graduated from the Department of Tourism and Hotel Management and had been in this sector for more than 20 years.

Second interviewed company (Company B) was a software programming company that provide specially designed products for restaurants and cafes. This company was a small firm that provides its services mainly for the city of Ankara with six employees. The researcher had 120 minutes interview with both the owner and co-founder of the company in their office in Ankara. This company established by making jukeboxes for various businesses but due to the advancement of digital technology and high prices of the sector, they moved to make software programs and similar technological solutions for foodservice businesses in Ankara. Company B developed its main software gradually and slowly over the years and now it is capable of providing various types of services for any type of restaurant and cafes. According to the owner of the company, until now they sold more than 350 different types of their products and they rarely lost any of their customers. Their capability for customization of their products and services for their customers with no extra charge gave them a

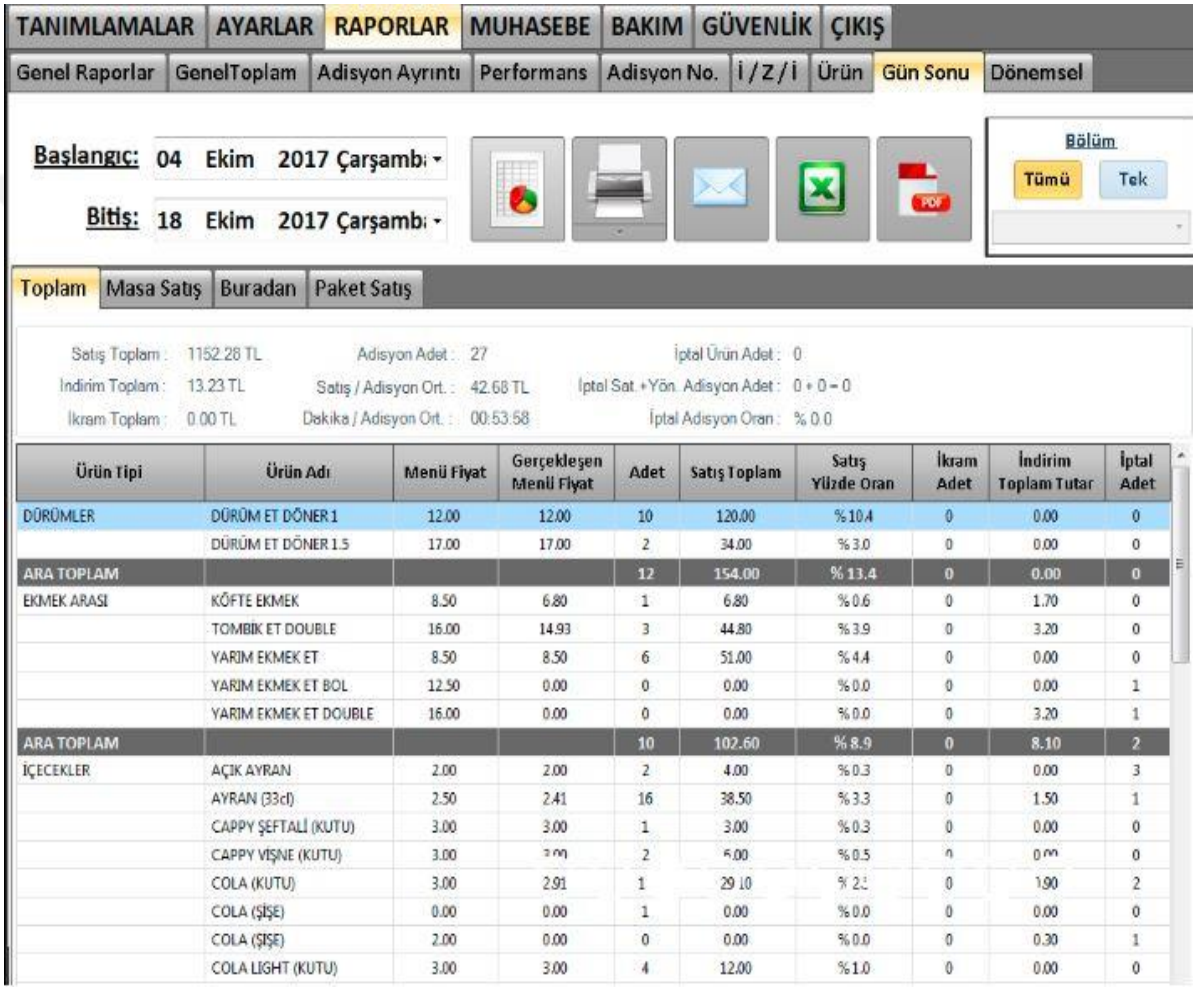
competitive advantage over their competitors in the sector.

### 4.1.2 Technological Solutions and Their Characteristics in Turkey

The first phase of interviews started with general questions about products and services that the company provides for restaurants and cafes. Company A, which can be considered as a leader in the sector, provided a wide range of technological solutions for almost all types of challenges that a foodservice business may face during its existence. According to interviewee A, their customers vary according to the city that they perform. For example, most of their customers in Ankara consist of restaurants and cafes while in other cities such as Antalya they are mainly hotels. As a result, their needs and their priority may change accordingly. For instance, reservation systems through various tools and monitoring the procedure with minimum error is a crucial task for hotels while it may not be as important for restaurants and cafes. However, there are challenges that are common and very similar through all types of hospitality and foodservice businesses. Staff management, accounting, stock management, customer relationship management, and digital marketing are some of such challenges that there exist various types of technological solutions for each of them. In addition, Company A recently started to develop mobile applications for their customers. Starbucks Coffee Company is one of its customers in Turkey that use their services. Interviewee A stated that such applications not only inform customers with instant promotional and other important information regard to the brand but also can create loyalty programs specially designed for the business. For instance, Starbucks customers can collect points by reading the QR code of purchased products and later they can get their desired free beverage whenever they want.

Unlike Company A, Company B focused on only restaurants and cafes. This company was capable of presenting technological solutions for operations that include both front of the house and back of the house. Co-founder of the company stated that the development of the main software took time to finish but that enabled them to modify and expand it properly and now they are capable of providing various types of services to all types of restaurants and cafes. They provide solutions such as waiter

mobile applications that not only enable extra options for customers to check out but also save sales data and create useful reports with respect to desirable criteria. Example of such reports presented in Figure 29.There are also other solutions that are specifically designed for restaurants and cafes. Menu management is one of them that enables the business to monitor and categorize all items in the menu according to the preferences of decision-maker. Items in the menu can be assessed with respect to used ingredients which allow decision-maker to set prices properly.




| Ürün Tipi | Ürün Adı | Menü Fiyat | Gerçekleşen Menü Fiyat | Adet | Satış Toplam | Satış Yüzde Oran | İkram Adet | İndirim Toplam Tutar | İptal Adet |
|---|---|---|---|---|---|---|---|---|---|
| DÜRÜMLER | DÜRÜM ET DÖNER 1 | 12.00 | 12.00 | 10 | 120.00 | % 10.4 | 0 | 0.00 | 0 |
| | DÜRÜM ET DÖNER 1.5 | 17.00 | 17.00 | 2 | 34.00 | % 3.0 | 0 | 0.00 | 0 |
| ARA TOPLAM | | | | 12 | 154.00 | % 13.4 | 0 | 0.00 | 0 |
| EKMEK ARASI | KÖFTE EKMEK | 8.50 | 6.80 | 1 | 6.80 | % 0.6 | 0 | 1.70 | 0 |
| | TOMBİK ET DOUBLE | 16.00 | 14.93 | 3 | 44.80 | % 3.9 | 0 | 3.20 | 0 |
| | YARIM EKMEK ET | 8.50 | 8.50 | 6 | 51.00 | % 4.4 | 0 | 0.00 | 0 |
| | YARIM EKMEK ET BOL | 12.50 | 0.00 | 0 | 0.00 | % 0.0 | 0 | 0.00 | 1 |
| | YARIM EKMEK ET DOUBLE | 16.00 | 0.00 | 0 | 0.00 | % 0.0 | 0 | 3.20 | 1 |
| ARA TOPLAM | | | | 10 | 102.60 | % 8.9 | 0 | 8.10 | 2 |
| İÇECEKLER | AÇIK AYRAN | 2.00 | 2.00 | 2 | 4.00 | % 0.3 | 0 | 0.00 | 3 |
| | AYRAN (33cl) | 2.50 | 2.41 | 16 | 38.50 | % 3.3 | 0 | 1.50 | 1 |
| | CAPPY ŞEFTALİ (KUTU) | 3.00 | 3.00 | 1 | 3.00 | % 0.3 | 0 | 0.00 | 0 |
| | CAPPY VİŞNE (KUTU) | 3.00 | 3.00 | 2 | 6.00 | % 0.5 | 0 | 0.00 | 0 |
| | COLA (KUTU) | 3.00 | 2.91 | 1 | 29.10 | % 2.5 | 0 | 1.90 | 2 |
| | COLA (ŞİŞE) | 0.00 | 0.00 | 1 | 0.00 | % 0.0 | 0 | 0.00 | 0 |
| | COLA (ŞİŞE) | 2.00 | 0.00 | 0 | 0.00 | % 0.0 | 0 | 0.30 | 1 |
| | COLA LIGHT (KUTU) | 3.00 | 3.00 | 4 | 12.00 | % 1.0 | 0 | 0.00 | 0 |

Figure 29. Company B‘s software tool environment and reports that it can provide

Company B’s most innovative and recent product is a real-time data management service for franchises by the name of KVY(in Turkish: *Kurumsal Veri Yönetimi*) that allow decision maker of multiple businesses to monitor and access

important data related to the performance of multiple locations at the same time (Figure 30). Moreover, decision-maker can add or modify a product in the menu for all location in less than 10 minutes with the help of technical customer service of the company that is available from 8 am until 12 pm every day. Another recent service of the company is the integration of their ordering systems with the most popular online ordering website in Turkey, which is “yemeksepeti.com”. All orders that are placed through yemeksepeti.com or its mobile application will transfer and recorded immediately within the installed system of the business and allow smooth ordering operation for the business.

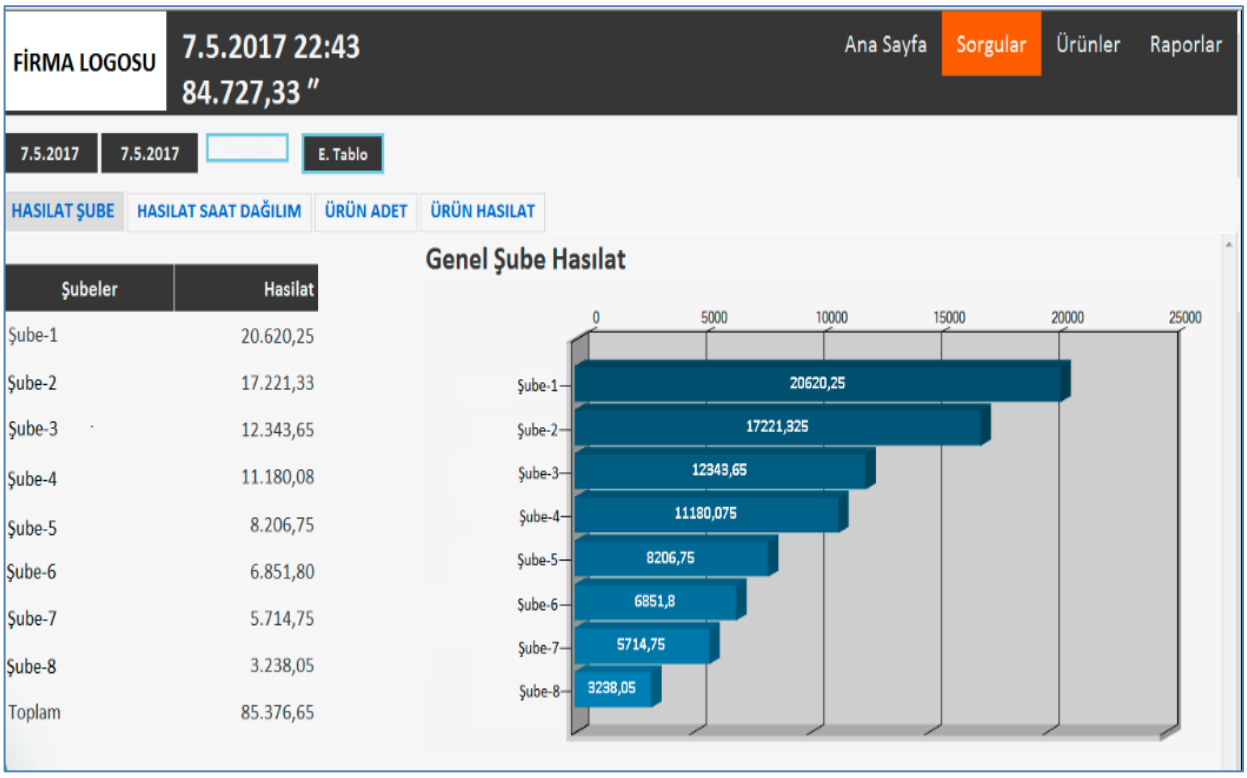



Figure 30. Enterprise Data Management service provided by Company B

During interviews, some characteristics of technological solutions for restaurants and cafes discussed with experts. Interviewee A believed that the most important characteristic of such technological solutions is their speed. He stated that increasing speed of operations is crucial for most foodservice business especially for fast food restaurants. He stated that proper mobile POS systems can eliminate all extra

and unnecessary waiting times and increase the performance of the business dramatically. On the other hand, interviewee in company B believed that the most important advantage of using such solutions is eliminating errors and mistake. According to them, discipline and arrangement are the most important factors in a foodservice business and managing tasks properly will increase the performance of the business on its own. Even the owner of company B stated that they choose the slogan of their company as "söz uçar yazı kalır" which is a Turkish idiom stating the importance of documenting and managing tasks. All interviewed experts agreed that technological solutions improve the security of the business by preventing stealing which is a common phenomenon in restaurants and cafes. Point of sales terminals creates a clear environment in the business that allows managers or owner to monitor easily transaction within the business. Moreover, they all believed that availability of such solutions for foodservice business is at its highest in Turkey. Meaning that it is very easy for decision-makers to search and find a proper technological solution that matches their needs. To prove this point, Interviewee A stated that there are companies that provide their software programs free of charge for a month. This can allow restaurants and cafes to get familiar with the environment of such products and see how it actually works and if it matches their needs, they can purchase it later. For example, one can easily download such software programs from www.simparasuite.com and after installing the program on their system, they can access to full free trial version for a month.

### 4.1.3 Challenges and Barriers for Adaptation of Technological Solutions for the Foodservice Industry in Turkey

The second phase of the interview started by asking a question about barriers and challenges for adopting technological solutions by the foodservice business in Turkey. After comparing both interviews, it could be inferred that all experts pointed out common barriers in different forms. According to Interviewee A, lack of knowledge and information in the sector is the main barrier for developing technological solutions among restaurants and cafes in Turkey. Interviewee A believed

that absence of knowledge on available technologies creates fear among restaurateurs and managers toward adopting such solutions into their businesses and this fear stops them to operate efficiently. Interviewee A stated:

> *"Some restaurateurs need related education to understand how simple software can save lots of money and time for their business. Especially the old generation of restaurateurs thinks paying money for such technological solutions is a waste of money and it is better to spend that money on better furniture and tables. The appearance of the restaurant is also very important but the first priority should be cutting extra costs and maxing your profit in the best way possible. Right effective technology solution can act as a wing for a restaurant and get the best out of its true potential."*

Interviewee A also mentioned problems related to the current economic situation in Turkey but he believed that this situation is not permanent and the market will adapt itself eventually. Interestingly, Interviewee B also stated that the lack of qualified human source always has been the biggest struggle for the foodservice industry in Turkey. He believed that skilled personnel is really scarce in this sector, and it includes both staff and decision-makers of restaurants and cafes. Interviewee B stated that the current level of technology provides practical solutions which satisfy the need for existing problems, however, it is the people in the sector that need to develop more. In addition to that, he believed that the recent economic crisis is a real challenge for the foodservice industry in Turkey. Interviewee B claimed that increase in cost of raw material is forcing some restaurants and cafes to close and stop those that are considering opening. He stated, "This phenomenon totally affected our sales over the last year. We forecasted to have around 100 sales in 2018 but unfortunately, we got one-fourth of our expectation. ''

### 4.1.4 Future of Technology for the Foodservice Industry in Turkey

In the final phase of interviews, the researcher asked participants to predict and share their thoughts about the future of technological solutions for the foodservice industry in Turkey. Interviewee A believed that we would see more innovations for the BOH (Back of the house) operations especially for the kitchen of restaurants and cafes. Interviewee A stated:

> *"It seems to me that the next big revolution in the sector will be for the back of the house. Robots in the future have the potential to be the next game changer for the industry. There are machines that make burgers from A to Z including the dough, in just 8 minutes. Existing technological solutions for the front of the house fulfill the need for now but there are plenty of potentials in the kitchen and back of the house. Websites such as yemeksepeti.com made a huge positive impact on the industry and I believe we may see another big improvement similar to that for the BOH in coming years."*

Interviewee B first mentioned their strategy and roadmap for the future and later talked about the future of technology solutions. He stated that in near future technology index would lower the cost in the sector and more restaurants and cafes will try technological solutions. As a result, they are looking forward to more intelligent solutions for existing challenges and at the same time, they will try to make the existing solutions in the most convenient way possible. In addition to that, they plan to design a system that educates their customers by providing them with valuable and necessary information related to their business. Such an education system would apply for not only decision-makers but also staff as well. On the context of the future for the sector, he stated that artificial intelligence (AI) modules programs are coming and will enhance the decision-making process, especially for chain restaurants. Nowadays fast food restaurant branches can determine the number of specific units needed on the exact time of the day with the help of tree decision tools. Such smart solutions can make the job of these restaurants much easier and during rush hours of the week.

### 4.1.5 Summary

Comparison of both interviewed companies and discussed topics are summarized in the below table.

Table 7. Comparison of both interviewed companies

| | Company A | Company B |
|---|---|---|
| Establishment | 1989 | 2010 |
| Number of employees | 250 | 6 |
| Interviewees Position | Area Sales Executive | Owner and Co-founder |
| Most innovative products or services | Mobile applications<br>Loyalty programs | Yemekspeti.com Integration<br>Cooperate Data Management |
| Biggest Challenges for adopting technological solutions in Turkey | Lack of knowledge(Ignoring the importance and effectiveness of technology) | Recent economic crisis<br>Lack of qualified human resource |
| Prediction for technological advancement in the industry | Back office technologies | Artificial Intelligence(AI) |

## 4.2 Structured Interviews with Restaurateurs and Managers

The second phase of data collection for this research started with structured interviews with restaurateurs and managers in Ankara. Before each interview, the researcher gave a brief introduction about the topic of research and illustrated some specific technological solutions, which were asked in the questionnaire. Moreover, the researcher explained to interviewees that they could freely express their thoughts on each question and such comments noted by the researcher and some of them mentioned in the text. Total of 18 structured interviews conducted with 12 Owners and 6

Managers (Figure 31). Most of the participants were responsible for a single business and only four of them were responsible for multiple locations. Respondents consist of 17 male and only one female.

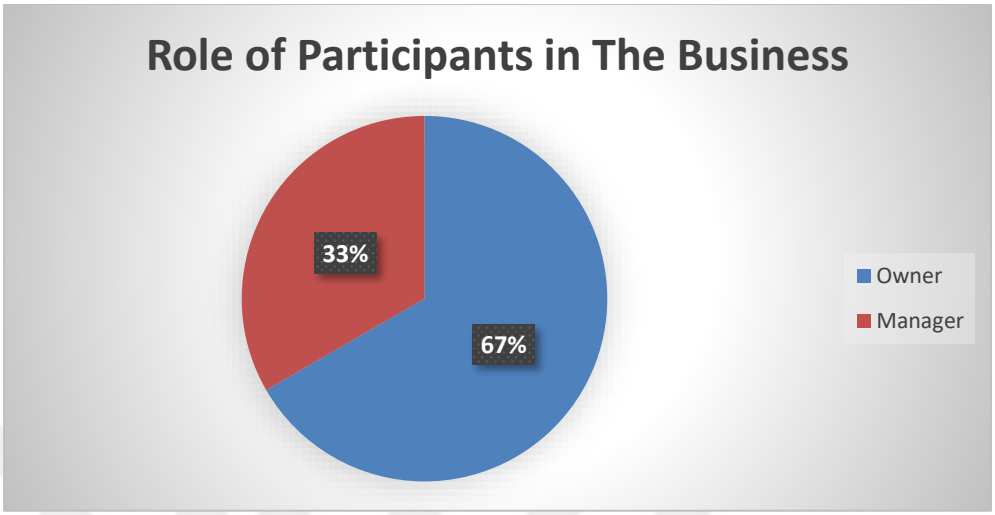



Figure 31. Participants' role in the interviewed locations

### 4.2.1 Types of Interviewed Businesses

Four main categories of foodservice businesses selected for interviews. Interviewed businesses included five full-service, five fast food, six cafes & pastry, and two bar /club. Full-service businesses include restaurants that offer a wide selection of foods/beverages and provide customers with table service. These types of restaurants in Turkey includes all types of *Lokankta, Kebapçi, Ocakbaşı*, etc. Figure32 demonstrate how businesses within the sample are categorized.

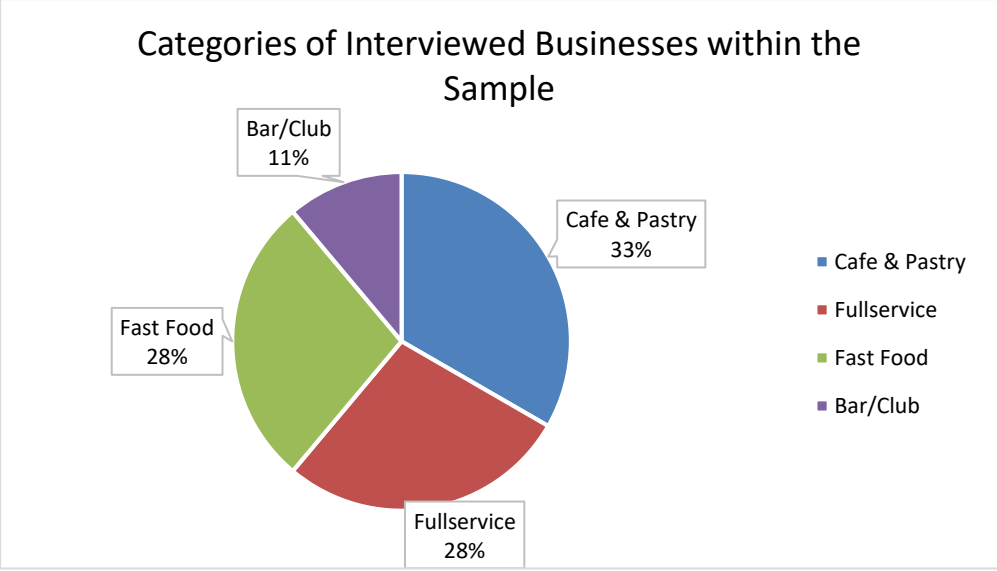



Figure 32. Categories of Interviewed Businesses

### 4.2.2 Level of Technological Use

In order to examine the applied level of technology into business and also how the businesses manage their transactions and operations, participants were asked to select types of equipment and technology they use from following options: Pen & Paper, Cash Register, Custom-build system, Waiter & Customer calling system, Basic POS Systems, Advanced integrated POS system, Machines & Robots, and Cloud-based systems. As it is illustrated in Table 8, the cash register was the most used tool among visited places. Pen and paper, POS systems and custom-built systems were all equally used. Details of related data are summarized in the Figure 33.

Table 8. Types of used tools in interviewed locations

| Used Tools | Responses | | Percent of Cases |
|---|---|---|---|
| | N | Percent | |
| Pen & Paper | 7 | 17.5% | 38.9% |
| Cash Register | 10 | 25.0% | 55.6% |
| Custom-build system | 7 | 17.5% | 38.9% |
| Basic POS Systems | 7 | 17.5% | 38.9% |
| Advanced integrated POS systems | 7 | 17.5% | 38.9% |
| Machines & Robots | 1 | 2.5% | 5.6% |
| Cloud-base systems | 1 | 2.5% | 5.6% |
| | 40 | 100.0% | 222.2% |

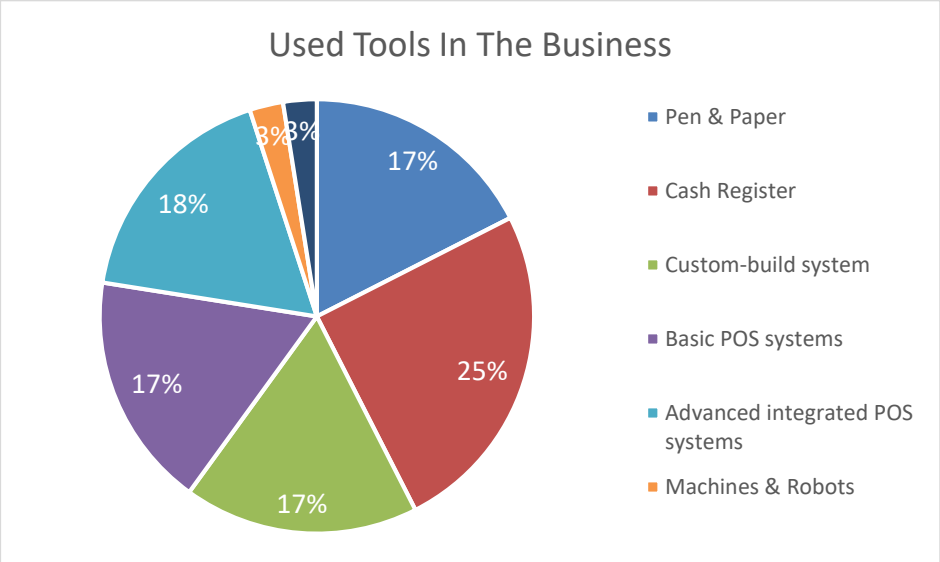



Figure 33. Types of used tools in interviewed locations

### 4.2.3 Reasons for Better Tools and Upgrade

When interviewees asked about their top reasons for replacing their current equipment, the following results were obtained. Better service, ease of use, and business growth are all equally important reasons for upgrading according to decision makers (Table 9). Reliability and better features are also concerning for decision makers for an upgrade. However, it seems that most respondents were happy with how fast their businesses are operating and do not feel a need for faster and more integrated systems in their businesses.

Table 9. Main reasons for upgrading existing systems

| Reasons for Upgrade | Responses | | Percent of Cases |
|---|---|---|---|
| | N | Percent | |
| Advanced Functionality | 7 | 16.3% | 38.9% |
| Ease of use | 8 | 18.6% | 44.4% |
| Business Growth | 8 | 18.6% | 44.4% |
| Reliability | 6 | 14.0% | 33.3% |
| Speed | 4 | 9.3% | 22.2% |
| Integrations | 2 | 4.7% | 11.1% |
| Better Service | 8 | 18.6% | 44.4% |
| | 43 | 100.0% | 238.9% |

Moreover, two of interviewees mentioned that the main reason for holding them from the upgrade is their current staff and when they hire new staff, most probably they will consider for an upgrade. These comments noted by the researcher as follows, “Sometimes I feel the need for an upgrade for better and integrated POS systems but our new recruited staff just adopted with the current system and don’t want to deal with the new system at the moment.” (Interviewee 10, Position: Manager, personal communication) and “They (waiters) barely learned how to work with current equipment. Our current system is very simple to use but still lots of error and mistakes happen.” (Interviewee 5, Position: Owner, Personal communication). Such comments and thoughts from decision makers match with the previous discussion with experts about the need for more qualified staff and lack of skills and knowledge in the industry.

### 4.2.4 Important Characteristics of Technology for Restaurants and Cafes

In the next part of structured interviews, interviewees asked to select important characteristics that seem important to them when it comes to technology in the foodservice industry. According to respondents, the most selected characteristics for technological solutions is the increased efficiency that they bring for the business. After that, the most important characteristic was the customizability. Advanced functionality/features and security seems to be not very important for decision makers. Table 10 illustrates how these characteristics values distributed.

Table 10. Important characteristics of technology from respondent perspectives

| Important Characteristics of Technology for the Foodservice Business | | | |
|---|---|---|---|
| | Responses | | |
| | N | Percent | Percent of Cases |
| Efficiency | 12 | 44.4% | 66.7% |
| Customizability | 6 | 22.2% | 33.3% |
| Advanced Functionality | 2 | 7.4% | 11.1% |
| security | 3 | 11.1% | 16.7% |
| Integration with other systems | 4 | 14.8% | 22.2% |
| | 27 | 100.0% | 150.0% |

During interviews, the importance of customizability brought to attention a few times on various occasion but it seems that business owners and manager would choose efficiency as their first priority. The following comment noted during one of the interviews by the researcher, “Previously we were using basic POS equipment but it keeps failing and customer service was not good enough. One of our friends helped us to build our own custom mobile POS systems that satisfy our needs.”(Interviewee 18, Position: Manager/Owner, Personal communication)

### 4.2.5 Interesting Technological Solutions for Restaurants and Cafes

As it was discussed in chapter two of this study, there are various types of technological solutions that can be applied in a restaurant or cafe. It was important to explore in which topics Turkish restaurateurs prefer to bring technology into their business. Questionnaire’s results reveal that the most appealing topic for applying new technology is for attracting new customers to the business. Moreover, back office topics for inventory and staff management seems to be attractive for managers and owners. Interestingly, few participants mentioned the need for innovation in the kitchen as a part of the back of the house. Seating and waitlist management was the least popular topic which is not a surprise since only very busy and crowded businesses seek for such solutions and ordinary places do not feel for such a need. Table 11 illustrate how these topics were selected in more detail.

Table 11. Interesting business processes for technology

| Interested Topics for Technological Solutions | Responses | | Percent of Cases |
|---|---|---|---|
| | N | Percent | |
| Finding New Customers | 14 | 28.0% | 77.8% |
| Seating & Waitlist Management | 2 | 4.0% | 11.1% |
| Inventory Management | 8 | 16.0% | 44.4% |
| Takeaway | 5 | 10.0% | 27.8% |
| Entertainment | 4 | 8.0% | 22.2% |
| Ordering | 3 | 6.0% | 16.7% |
| Staff Management | 6 | 12.0% | 33.3% |
| Loyalty programs | 3 | 6.0% | 16.7% |
| Kitchen | 5 | 10.0% | 27.8% |
| | 50 | 100.0% | 277.8% |

To follow up this topic, interviewees asked to rate the importance of the specific topic for their businesses from 0 to 5. These topics had the potential to contain digital technology and were as follow: Restaurant discovery and attracting new customers, loyalty programs and CRM systems, entertainment, ordering, payment methods, seating, and waitlist management.

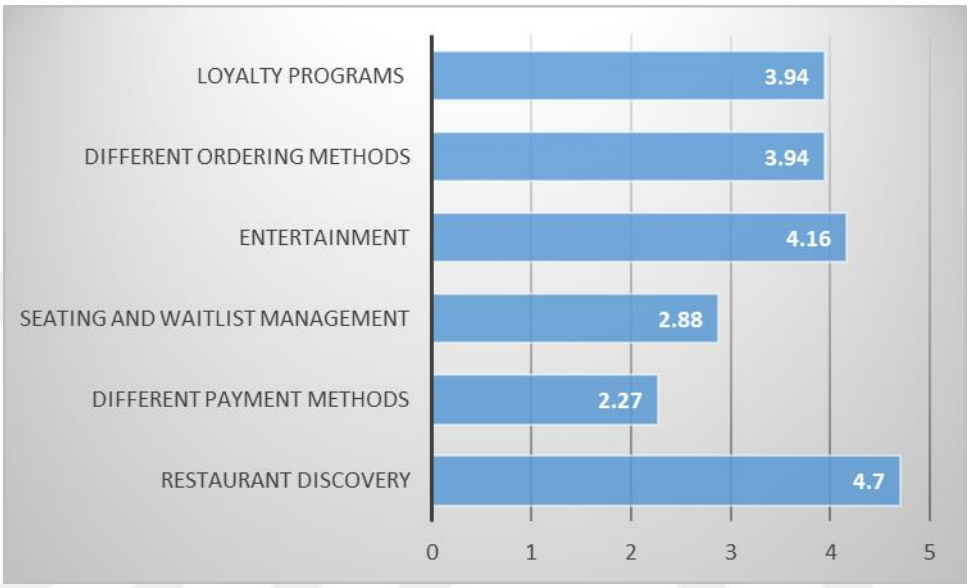



Figure 34. The given value by participants for the adaptation of technology in asked business processes

According to collected data, the least interesting topic for owners and manager was bringing new methods and technologies for payment (Figure 34). Various participants expressed their negative thought about this topic several times during interviews. For example, one participant mentioned, “There are already too many methods for payment and each method needs its own equipment. Not to mention that most of them cut some profit from us. The best method is cash for us!”(Interviewee 13, Position: Manager, Personal communication).

Loyalty programs, ordering, and entertainment valued almost equally by the participants. The most rated topic was new ways of discovering business and attracting more customers. Hiring professionals for managing business’s social media pages

seems like an effective method for growing and attracting new customers to the business. One of the participants mention this topic as follow, “our other branch, which is owned by my uncle, hired some people for managing their Facebook and Instagram pages and they have 3 times more followers than our business.” ( Interview 13, Position: Manager, Personal communication)

### 4.2.6 Desired Topics for Upgrades on POS Terminals

As it was mentioned previously by technology provider firms, point of sales (POS) systems are most demanded technological solution for restaurants and cafes. Moreover, POS systems have a wide range of variety and they keep growing as time goes by. As a result, it was important to find out what kind of an upgrade, decision makers prefer for their POS systems. This question was asked only from those participants that stated they are already using POS systems in their businesses. Following results obtained and they are summarized in Table 12 and Figure 35.

Table 12. Interesting topic for POS upgrades

| POS Upgrades | Responses | | Percent of Cases |
|---|---|---|---|
| | N | Percent | |
| Inventory management | 3 | 11.5% | 17.6% |
| Online ordering | 5 | 19.2% | 29.4% |
| Monthly software updates | 1 | 3.8% | 5.9% |
| Tablet-based | 4 | 15.4% | 23.5% |
| Cloud-based | 1 | 3.8% | 5.9% |
| Mobile-wallet Integration | 2 | 7.7% | 11.8% |
| Social-Media integration | 10 | 38.5% | 58.8% |
| | 26 | 100.0% | 152.9% |

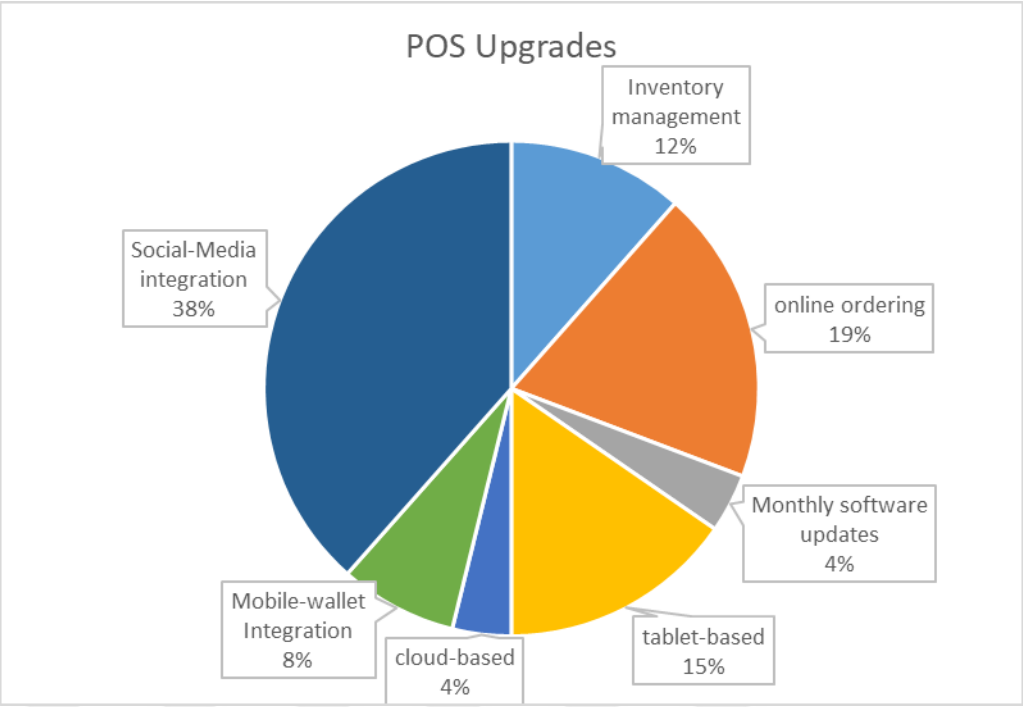



Figure 35. Interesting topic for POS upgrades

"Monthly software update for POS system" and "cloud-based feature" only selected one time and they were least favorite upgrade in the decision-makers' opinion. Online ordering and tablet-based POS systems seemed interesting to respondents but not as much as social media. The most interesting upgrade option for POS systems was social media integration. Social media plays a very important role in the digital world for businesses and each day more people join such platforms. It seems Turkish restaurateurs are aware of this subject since 38 % of respondent selected social media integration upgrade for their POS systems. Later, more data collected in regard to digital advertising and social media of interviewed places.

### 4.2.7 Preparation for Upgrade

In order to explore more aspects of participants' thoughts for applying new technology or upgrading existing systems, they were asked about the time when they want to apply such plans. Following result obtained which illustrated in Figure 36. Half of the participants plan to apply needed technology solutions within 6 months.

This result indicates that most participants somehow want technology into their business in the near future. Only one respondent mentioned that there is no need for any type of upgrade or new technology into the business.

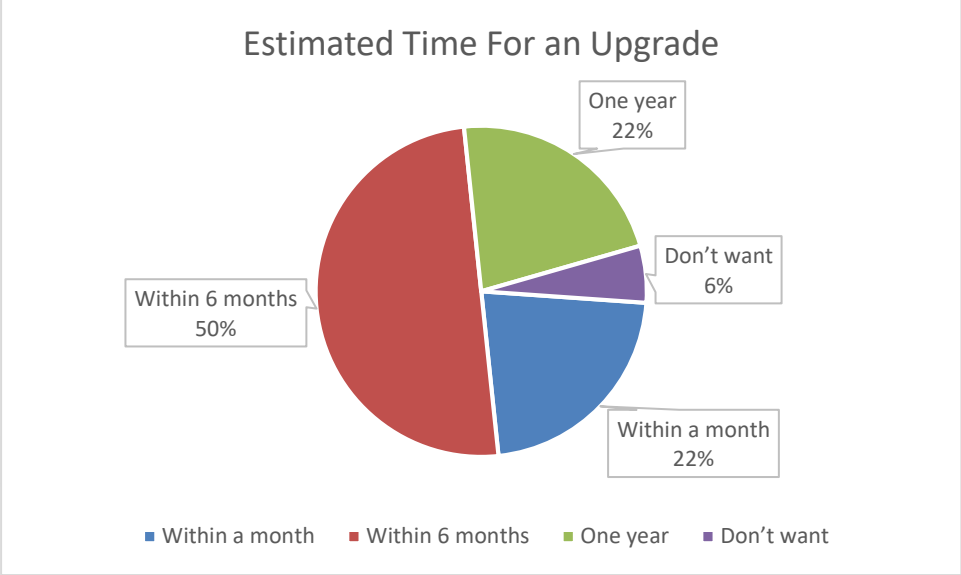



Figure 36. The estimated given time by respondents for a technological upgrade

After discovering the thoughts and preferences of decision makers about upgrading their businesses' technological solution, interviewees asked how much they think their business is ready to adopt new technology. Participants asked to rate the level of their business's readiness from 0 to 5. None of the participants selected 0 and only two participants rated 1 as their level of readiness for technology. Eight participants, which include 44% of the respondent, selected 3 as their readiness level. Rest of participants equally valued 4 and 5. In other words, almost 90% of participants rated 3 and above which indicate most of the interviewed places somehow feel ready for applying new technology and innovation.

### 4.2.8 Challenges and Barriers for Technology Adaptation

It was very important to discover what types of issues concern the mind of the Turkish decision-makers for bringing technology into their businesses. What do

they think are the main challenges and obstacles for applying new technology into their business? As a result, the list of topics that could be potential concerns prepared and later asked to participants. Following results summarized in Table 13.

Table 13. Existing barriers for technology implementation

| Concerns for Applying Technology Solutions | Responses | | Percent of Cases |
|---|---|---|---|
| | N | Percent | |
| Too expensive | 9 | 36.0% | 50.0% |
| Hard to manage | 1 | 4.0% | 5.6% |
| Lack of knowledge | 6 | 24.0% | 33.3% |
| Return of Investment (ROI) | 6 | 24.0% | 33.3% |
| No expectations from customers | 2 | 8.0% | 11.1% |
| Hard to integrate | 1 | 4.0% | 5.6% |
| | 25 | 100.0% | 138.9% |

It is evident that the biggest concern is the price of technology solutions in the mind of decision-makers for adopting technology into their business. Half of the participants mentioned this as one of the main problems that stop them from purchasing technology solutions for their businesses. Related with that topic, it appears that decision-makers are not sure whether such expensive investment will pay its money back or not. Doubts about the return of investment (ROI) and lack of knowledge among staff on technology are both equally weighted according to the questionnaire. Two of respondents mentioned that customers in the first place do not expect and want to face with technology in the foodservice industry. This topic covered in the next section when the researcher moves the study attention toward customers. Finally, difficulty in managing new technology and troubles for integration into existing systems were the least concern among business owners and managers. Figure 37 illustrated these obtained result.

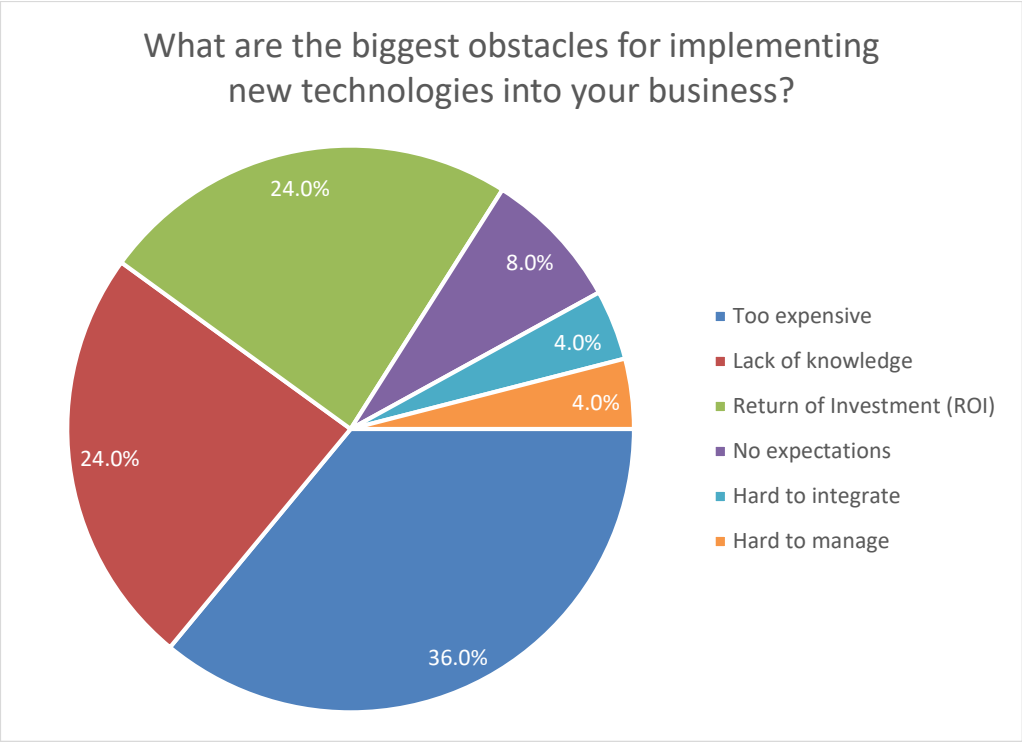



Figure 37. Existing barriers for technology implementation

### 4.2.9 Digital Marketing and Social Media

Another important topic that considered during interviews was the activity of restaurants and cafes in a digital word. Today's customer is connected to the internet and their mobile phones more than ever, as a result providing suitable digital services can bring competitive advantage for the business. Three questions regard to this topic were asked to the participants. First, they were asked whether their business has a website or mobile application. If they have, then what types of services the business provides for customers? Finally, which social media platforms they prefer for their digital activity. Almost half of the respondents stated that they only have an internet website for their business and the website just provide general information about the business and services it provides for customers. Six of interviewees has neither a website nor a mobile application for their businesses. Only one respondent stated that only mobile application is designed for the business and three businesses had both website and mobile application. Figure 38 summarize these obtained results.

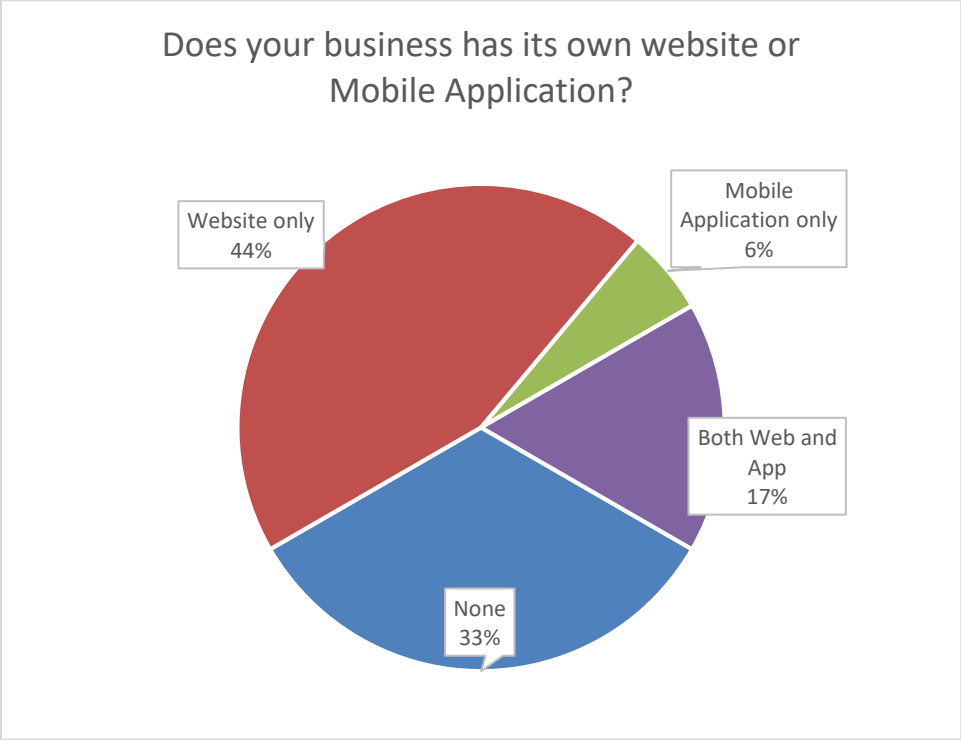



Figure 38. Digital marketing and social media implantation

As it was mentioned before, most of these businesses only use their website mobile app to provide general information about the business, its history, menu items, and contact information. However, four of respondents stated that customers are able to order online or make a reservation through their website or mobile application. In addition to that, two of respondents said that customer loyalty programs and promotions are available for customers who use their website or mobile application.

According to the results of the questionnaire, only one of participants did not have any social media for its business and it was due to the fact that the business was opened recently. The most favorite social media among interviewed restaurants and cafe was Instagram. All businesses that had social media had a page on Instagram. Facebook was the second most used social media among participants and Twitter and Google$^{+}$ was next respectively. None of interviewed locations had a channel page on YouTube which is somehow underestimating the power of this platform since it is one of the biggest platforms on the internet. Table 14 and Figure 39 illustrate these results.

Table 14. Preferred Social Media Platforms

| Social Media Platforms | Responses | | Percent of Cases |
|---|---|---|---|
| | N | Percent | |
| Facebook | 14 | 33.3% | 82.4% |
| Instagram | 17 | 40.5% | 100.0% |
| Twitter | 6 | 14.3% | 35.3% |
| Google+ | 5 | 11.9% | 29.4% |
| | 42 | 100.0% | 247.1% |

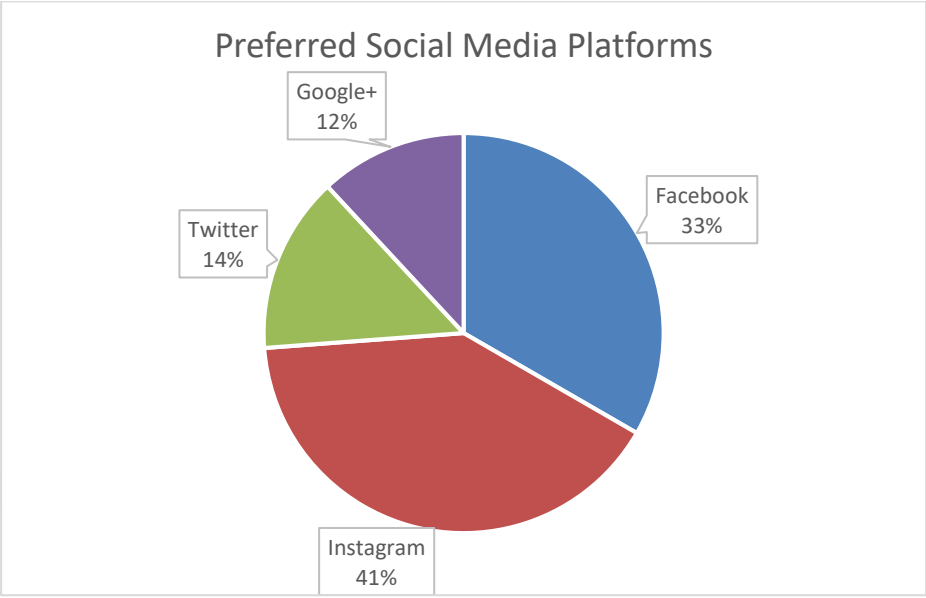



Figure 39. Preferred Social Media Platforms

### 4.2.10 Attitude toward Electronic Menu, Tabletop Technology and, Robots

At the end of interviews, participants asked about how much they are interested to bring three different types of technology into their businesses. All asked technologies were discussed in the literature review of this paper and include E-menu, tabletop technology, and robots and artificial intelligence. Brief information about each specific technology was given to interviewees and the following results presented in Figure 40.

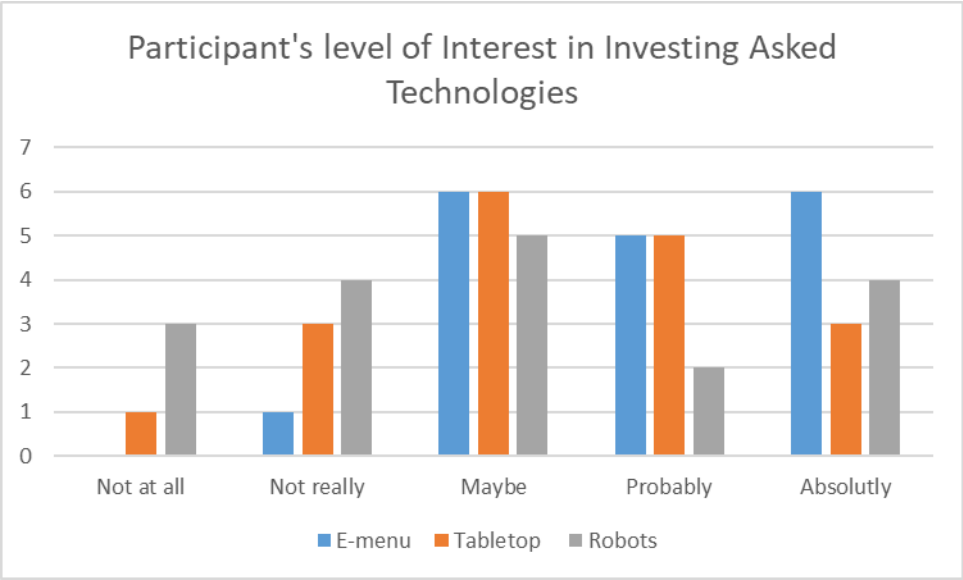



Figure 40. Participant's level of Interest in investing E-menu, tabletop and robotic technologies

Most of the participants showed a positive response for bringing E-menu technology into their businesses. Only one participant had a negative thought about this topic. It is worth mentioning that 2 of visited restaurants and cafes already had been using tablets as their menu. During interviews, very few negative comments made by interviewees and most of the opinions about E-menu were positive. Here are few of such comments noted by the researcher*," I have been saying this (designing E-menu) to our POS system provider company since day one. It will bring prestige and at the same time entertainment to the business*." (Interviewee 12, Position: Owner, Personal communication)

> *I am not sure if many customers feel comfortable using tablets as a menu. At least not in the near future. Maybe it is a good idea for a coming generation who are already used to smartphones and tablets*. (Interviewee 18, Position: Manager/Owner, Personal communication)

> *We have been using tablet-based menus over the last 3 years and I am happy with their performance. They save us both money and time. We have to modify and change our menu too many times especially over last year that prices of*

*raw materials keep changing rapidly and they have been a great help to the business*. (Interviewee 3, Position: Manager, Personal communication)

Since tabletop technology is not a known technology in Turkey, different types of such technology showed and explained to interviewees before discussing this topic. According to results, participants showed a bit less interest in tabletop technology compared to E-menu but still general opinion was not negative. Only four participants showed a negative response to this technology. It seemed that most owners and managers were unsure of what types of values such solution can create for their businesses. For instance, the following conversation exchanged with one of the participants and the researcher,

*I would like to use kiosk or touch tables in my business. It seems like a good investment to me. However, I am not sure if customers can use it properly. Most probably, these technologies are not cheap and I think our people still need time to adopt on how to use them.* (Interviewee 15, Position: Owner, Personal communication)

Result of the questionnaire indicates that using robots is least favorite technology among participant. Most of the participants indicated low interest or neutral response for using robots in their businesses. Statistically, only six participants showed the positive response for investing in such technology. However, some participants show very strong interest in using robots in their business. One of such response was as follow,

*… I made a lot of search on the internet in order to find a proper robot to interact with customers but Turkish versions were just not good enough and ordering from aboard was not available. I even talked with an R&D company and told them I am willing to invest on this topic but still no result.* (Interview 2, Position: Owner of eight different types of foodservice businesses, Personal communication)

### 4.2.11 Artificial Intelligence and Robots

At the end of interviews, another question related to robots and artificial intelligence were asked from the participant. Interviewees were asked to express their thoughts about the future of using robots and artificial intelligence in the foodservice industry. Two of the participants had no idea about this topic. Two participants responded that applying robots and artificial intelligence is not possible at all. Six participants mentioned that this idea can be applicable but not in the close future and it still needs time to develops. Eight participants believed that using robots and artificial intelligence in restaurants and cafes could be effective. Summary of collected data is illustrated in the Figure 41.

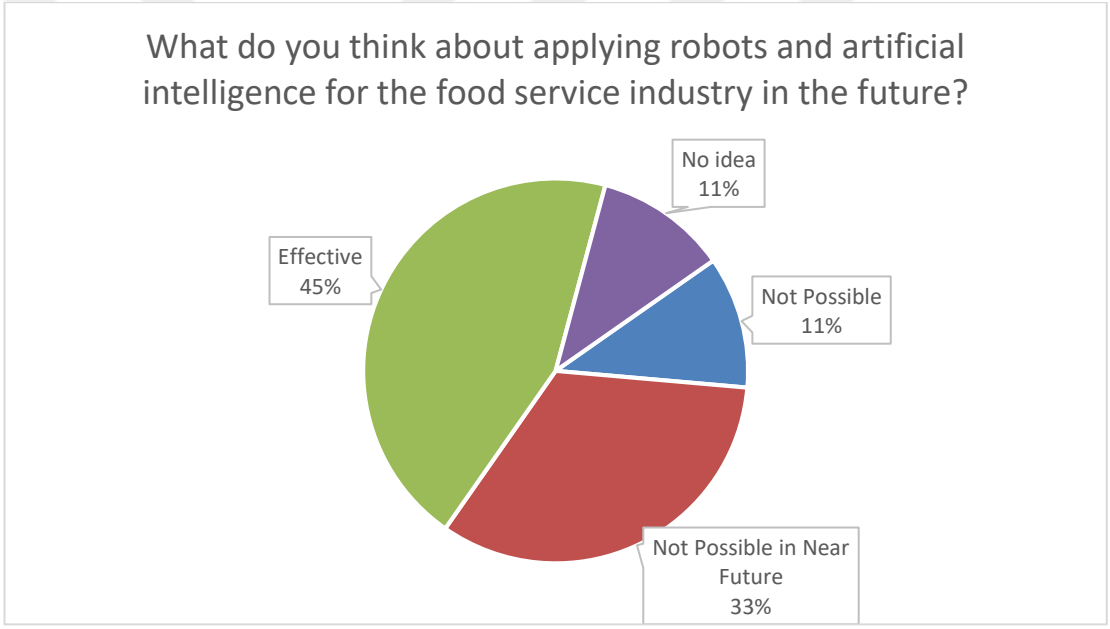



Figure 41. Participants' perception on the topic of artificial intelligence and robot in the food service industry

## 4.3 Quantitative Survey with Customers

As the last part of this study, quantitative research conducted in order to address the third objective of the research question of the study. The end user of the most discussed technologies in this research are customers of restaurants and cafes.

The final decision for having such technologies that are in direct contact with customers will be done by customers, not managers or owners. As a result, it is crucial to know their expectation and preferences about facing such technology solutions in restaurants and cafes. To do so, a short survey with 10 questions prepared (Appendix B). Survey questions focused on three main subjects. First, few questions related to demography and the habit of eating outside of participants were asked. Next, questions regard to interest level of customers toward certain types of technologies were asked. Most of these technologies were discussed in the literature review of this research. The Likert Scale used in order to measure the level of interest. Moreover, the extra question related to history usage of each technology asked from participants. They asked whether they encountered such technology in the past or not. Almost all of participants were selected randomly from customers waiting for their orders in restaurants and cafes that their owner or managers were interviewed previously. In the end, 261 valid questionnaires collected from randomly selected people in the city of Ankara. All data collected within March of 2019.

### 4.3.1 Demographic Characteristics of Participants

Among 261 collected questionnaires, there were 155 male and 106 female. Most participants in the survey aged between 20-30 that contains 40% of participants. Following demographic characteristics of the sample are demonstrated in the below Figure 42 and Table 15 in more detail.

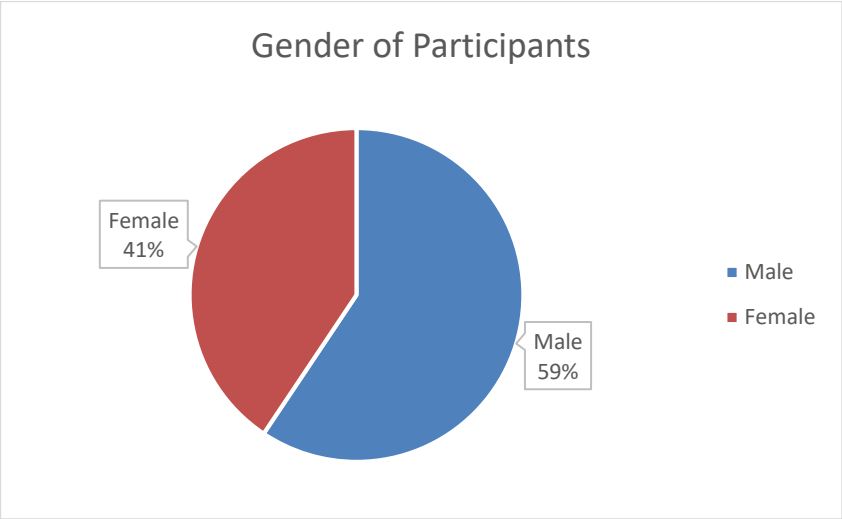



Figure 42. Gender of participants for customer survey

Table 15. Age groups of the participant for customer survey

| Age Groups | | |
|---|---|---|
| Age (years) | Frequency | Percent |
| Less than 20 | 29 | 11 |
| 20-30 | 163 | 63 |
| 30-40 | 32 | 12 |
| 40-50 | 18 | 7 |
| 50+ | 19 | 7 |
| Total | 261 | 100.0 |

### 4.3.2 Habit of Eating Outside

It was essential to know how often participants go to restaurants and cafes. Such information shows that how much our examined population is valid for measuring parameters for the foodservice industry. As a result, a question related to the habit of eating outside asked in the survey. Five options presented to participants in order to select the one that best describes how often they eat in restaurants and cafes. These options were as follow: infrequently (once a month or less), occasionally (about once a fortnight), regularly (an average of once a week), frequently (two-three times a week), very frequently (five times or more per week). It appears that most participants go to restaurants and cafes minimum twice a week. As a result, their opinion and

expectations can be considered valid and important for facing technology in restaurants and cafes. Table 16 and Figure 43 illustrate exactly how often participants indicated that they go to restaurants and cafes. Counting the fact that most of participants were aging between 20-30, it was no surprise to observe that almost half of participants indicate they frequently eat out side which mean eating out two or three times in a week.

Table 16. Customers' frequency of visiting restaurants and cafes

| Question) How often you go to restaurants and cafes. | | | | |
|---|---|---|---|---|
| | Frequency | Percent | Valid Percent | Cumulative Percent |
| Infrequently – once a month or less | 18 | 6.9 | 6.9 | 6.9 |
| Occasionally – about once a fortnight | 22 | 8.4 | 8.4 | 15.3 |
| Regularly – an average of once a week | 41 | 15.7 | 15.7 | 31.0 |
| Frequently – two-three times a week | 122 | 46.7 | 46.7 | 77.8 |
| Very frequently – five times or more per week | 58 | 22.2 | 22.2 | 100.0 |
| Total | 261 | 100.0 | 100.0 | |

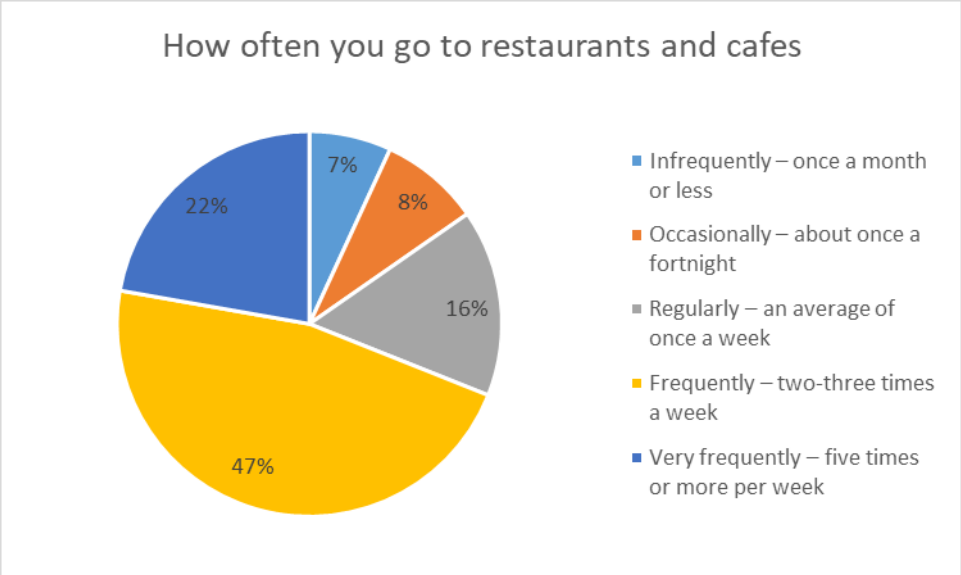



Figure 43. Customers' frequency of visiting restaurants and cafes

### 4.3.3 Most Favorite Places for Participants

Another important aspect of this study was to discover the types of restaurants and cafes that participants go. To do so, seven different types of foodservice businesses selected according to the Turkish market for the survey. Participants asked to select types of places they go more often when they go to eat outside. These seven categories were as follow; *Lokanta* (typical restaurants in Turkey), *Ocakbaşı* (kebab restaurant), *Dürümcü* (tortilla type restaurant), Fast food, Cafe & pastry, Bar & Clubs, and Luxury Restaurants.

According to the obtained results, the most favorite place among participants was Cafe & Pastry. Participants of survey selected Cafe & Pastry 154 times, which is 60% of all cases. The second most preferred category was fast food type restaurants. Fast food category contained 20% of all selected options. The least visited places were Luxury type restaurants according to the survey's result. This type of restaurants only mentioned 9 times by participants which mean around 3% of total cases. Other type places almost selected equally and there was not a big difference among them. Figure 44 and Table 17, demonstrate these obtained data in more details.

Table 17. Preferred places for eating outside among respondents

| Most selected Categories | | | |
|---|---|---|---|
| | Responses | | Percent of Cases |
| | N | Percent | |
| Restaurant | 25 | 7.3% | 9.6% |
| Kebab Restaurant | 28 | 8.2% | 10.7% |
| Dürümcü | 26 | 7.6% | 10.0% |
| Fast Food | 67 | 19.6% | 25.7% |
| Cafe & Pastry | 154 | 45.2% | 59.0% |
| Bar & Club | 32 | 9.4% | 12.3% |
| Luxury Restaurant | 9 | 2.6% | 3.4% |
| Total | 341 | 100.0% | 130.7% |

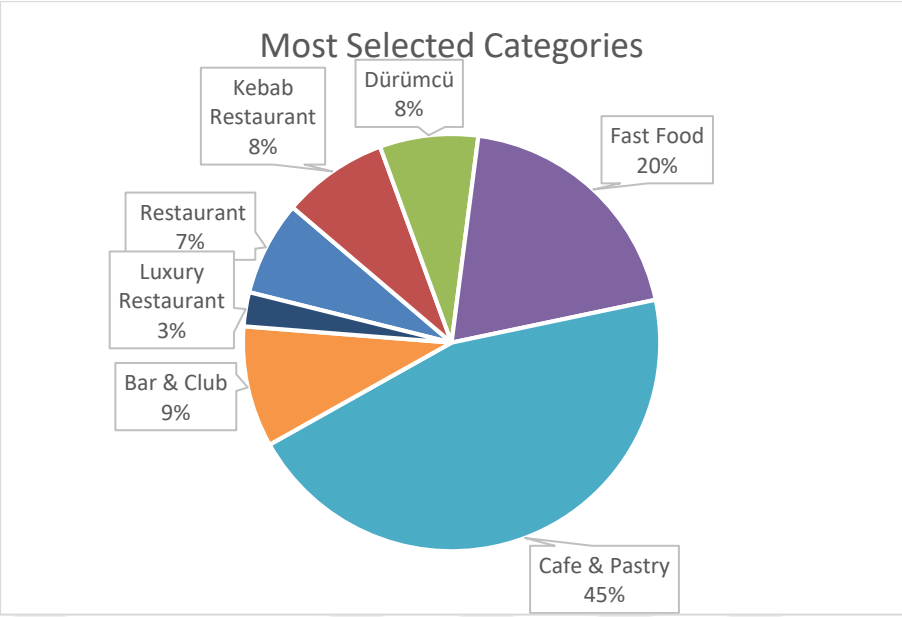



Figure 44. Preferred places for eating outside among respondents

### 4.3.4 Interests Level of Customers toward Different Types of Technologies

The main goal of this survey was to assess the attitude of customers toward certain types of technologies that were discussed with the decision-makers of restaurants and cafes previously. Some of such technologies were also mentioned in the literature review of this study. In the survey, participants were asked to select their interest level toward certain types of technology from Likert scale options. In addition to that, customers were asked if they ever had experience of using such technology in the past or not. Following technologies considered in the survey; waiter robots, chef robots, self-service kiosk, tablet-menu, touch screen tables, and mobile applications. Obtained data from each technology will be discussed individually in the following sections.

#### 4.3.4.1 Waiter Robot

The first technology that participants' opinion were asked was waiter robot technology that was discussed in the literature review. According to the obtained result, it can be concluded that participants showed a slight interest in facing such

technology. Only 10 % of participants indicated they are highly interested in seeing robots as a waiter in restaurants and cafes and 27% of them mentioned they are slightly interested. On the other hand, almost 50% of participants indicated that they are neutral or have no interest in such technology. The average value of Likert response for waiter robot was 2.77 and Figure 45 shows how obtained results are distributed. In addition, 91% of participants never had experience for this technology and only 24 individuals mentioned they faced waiter robot in the past. As it was mentioned in the literature review, a cafe in the Konya city use robots for greeting and delivering orders to customer's tables.

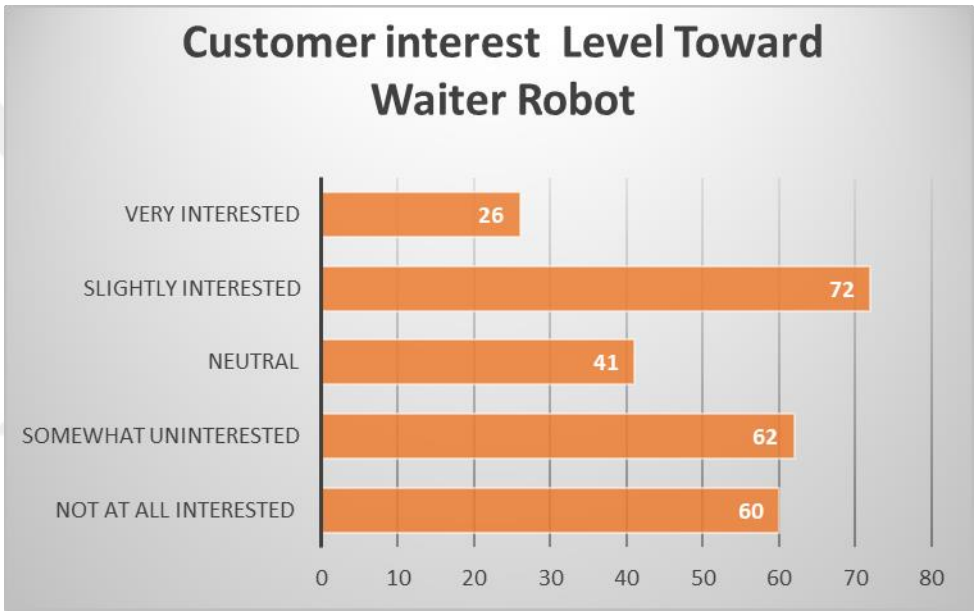



Figure 45. Customer interest level toward waiter robot

#### 4.3.4.2 Chef Robots

The second asked technology from participants was chef robots. Participants were asked to indicate how much they are interested to have their orders prepared or assisted by a robot. Obtained results indicate that participants showed more interest in chef robots rather than waiter robots, although both technologies had very similar responses. During collecting questionnaires, few participants mentioned that using chef robot will result in less hand contact and it was a positive feature from their point

of view. In general, 81 people, that include 31% of participants, were slightly interested in this topic. Moreover, 13 % of participants indicated that they are very interested in seeing chef robots in foodservice businesses. On the other hand, 40% of participants were either not interested at all or somewhat uninterested toward this technology. A number of people who were neutral about seeing chef robot were exactly the same as a waiter robot. Figure 46 demonstrate how these results are distributed. It may be concluded that from participants' view both technologies seems the same and their responses were very similar to one another. In fact the average value of Likert response for chef robots was 2.97 which was very close to waiter robot's value. In addition to that, Only 19 people, which include 8% of participants, stated that they had experienced such technology in the past. This result is also very similar to previous technology about waiter robots.

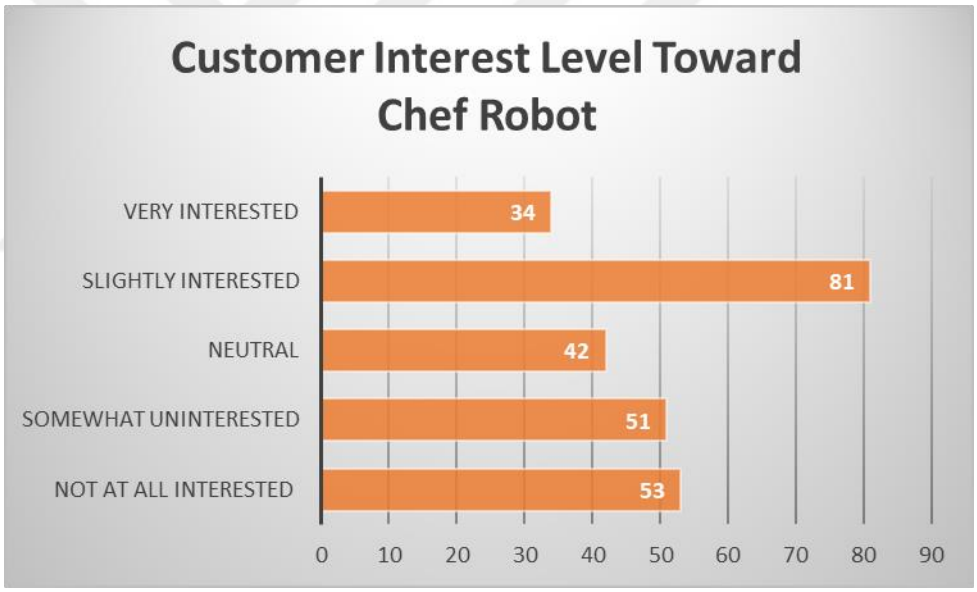



Figure 46. Customer interest level toward chef robot

#### 4.3.4.3 Self-Service Kiosk

The next technology was self-service technology within kiosk machines. Although this technology has been used frequently in places such as cinema and

shopping malls in Turkey, many participants were not familiar with this technology for restaurants and cafes. During collecting process of questionnaires, there had been multiple occasions that participants asked about this technology and the researcher explained briefly to them what this technology is about. The obtained result shows a considerable amount of interest in this technology among participants. Only 19% of participants indicated little or no interest at all toward using self-service kiosk technology. Majority of participants were somehow interested in using this technology. In total, 57% of participants showed positive toward using the kiosk in restaurants and cafes. In fact, 22 % of them were very interested and 35% were slightly interested in using this technology. Moreover, 64 people that is 24 % of participants were neutral on this topic. The average value of Likert response for kiosks was 3.5 and Figure 47 shows how the obtained results are distributed. On the topic of experiencing such technology, there were more people who had experienced self-service kiosk compared to previously discussed technologies. According to collected data, 81 individuals that include 32% of participants stated that they had experienced such technology while 175 participants never had experienced kiosk technology.

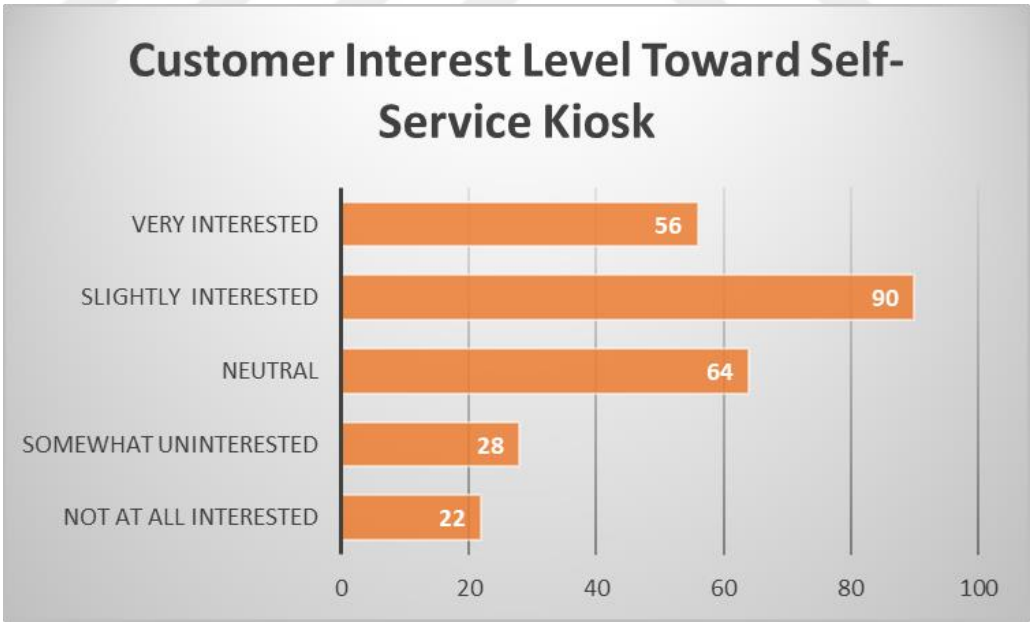



Figure 47. Customer interest level toward the self-service kiosk

#### 4.3.4.4 Tablet-menu

The next technology that participants' opinion were asked about was tablet-menu. Participants were asked how much they are interested to use a tablet as a menu in restaurants and cafes. It is worth mentioning that other features of tablet-menu such as using it for entertainment were not mentioned in the question. Collected data indicate a high number of the participants were slightly interested in using tablet-menu. This is 107 individual and includes 41% of participants. Moreover, 26 % of participants showed a strong interest in this technology. On the other hand, 10% of participants had no interest at all and 17 % of them were somewhat uninterested toward using the tablet as a menu in restaurant and cafes. Also, the small percentage of participants, that is 7 %, were neutral about this topic. The average value of Likert response for this technology was 3.54 and Figure 48 illustrates how the obtained results were distributed. The experience of using tablet-menu was very high among participants. In fact, it was highest among all asked technologies in the survey. More than 200 people, nearly 80% of participants, stated that they had used tablet-menu technology in the past. Considering the positive response of participants toward tablet-menu and the fact that most of them had experienced such technology, it can be concluded that this technology is a successful technological solution for restaurants.

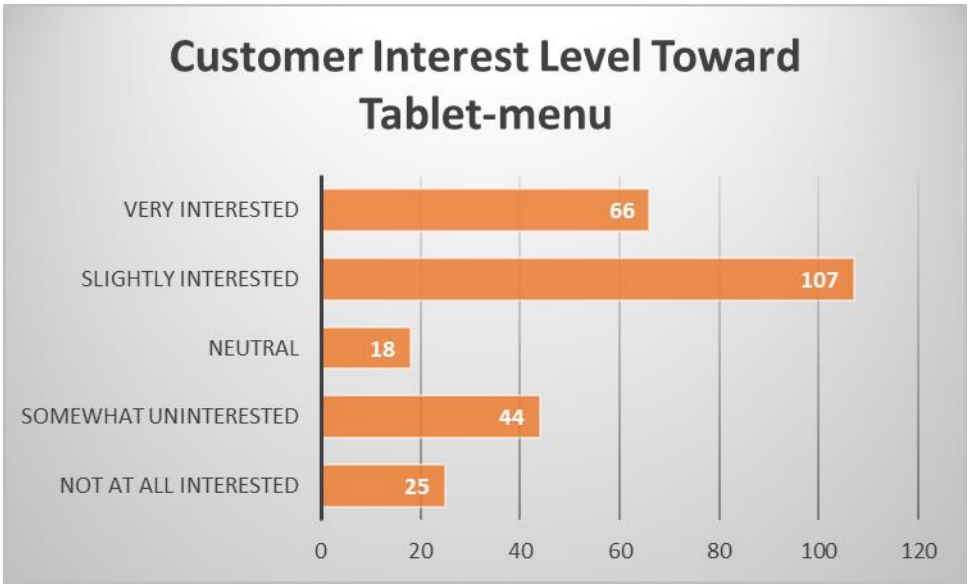



Figure 48. Customer interest level toward tablet-menu

#### 4.3.4.5 Tabletop technology

The next topic that participants were asked was touch screen tables which is a form of tabletop technology. Participants of the survey were asked to point out how much they are interested in encountering tables in restaurants and cafes that has touch screen ability on it. Extra features that may integrate with this technology such as self-service ordering and entertainment were mentioned in the question of the survey. Collected data indicate that the majority of participants wants to face such technology in restaurants and cafes. Only 9% of participants had no interest in using touch screen tables in addition to another 11% mentioned that they were somehow uninterested. A small percentage of participants, that is 8%, were neutral toward this technology. On the other hand, 73% of participants stated that they are somehow interested in seeing touch screen tables in restaurants and cafes. This number includes 46% that are slightly and 27% that are very interested in this technology. In general, the average value of Likert response for this technology was 3.65 and Figure 49 shows how obtained results are distributed. On the topic of having experience for such technology, it can be said that 84 individuals (33% of participants) had the experience and 177 individuals (67% of participants) never had experienced this technology in the past.

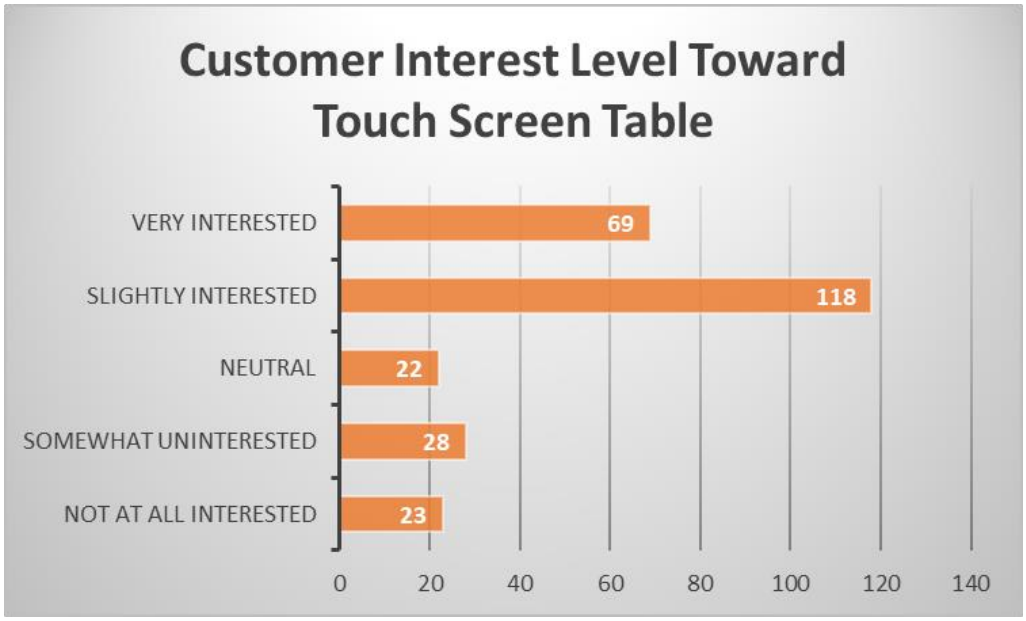



Figure 49. Customer interest level toward touch screen table

#### 4.3.4.6 Mobile application

The last technology that participants' opinions were asked was about mobile applications for restaurants and cafes. Nowadays using different types of mobile applications in a smartphone is a common thing especially among millennials. However, there are not that many mobile apps that are specially designed for foodservice businesses. In the survey, participants were asked to state how much they are interested in using restaurants and cafes mobile app. There was no mention on any specific feature or function for such mobile apps in the question. According to collected data from participants, 29% of the participants were very interested in this technology while 38% were slightly interested. Moreover, 40 individuals meaning 15% of participants were neutral toward using mobile app for restaurants and cafes. Meanwhile, only 10% of participants were somewhat uninterested in this technology and an even a smaller percentage (7% of participants) were somewhat uninterested. The average value of Likert response for mobile app was 3.68 and Figure 50 demonstrates how these responses are distributed .Collected data for the experience of using restaurants and cafes mobile application were as follow. Around 33% of participants (84 individuals) stated that they had experienced such technology while 67% (170 individuals) had never used the mobile app of restaurants and cafes.

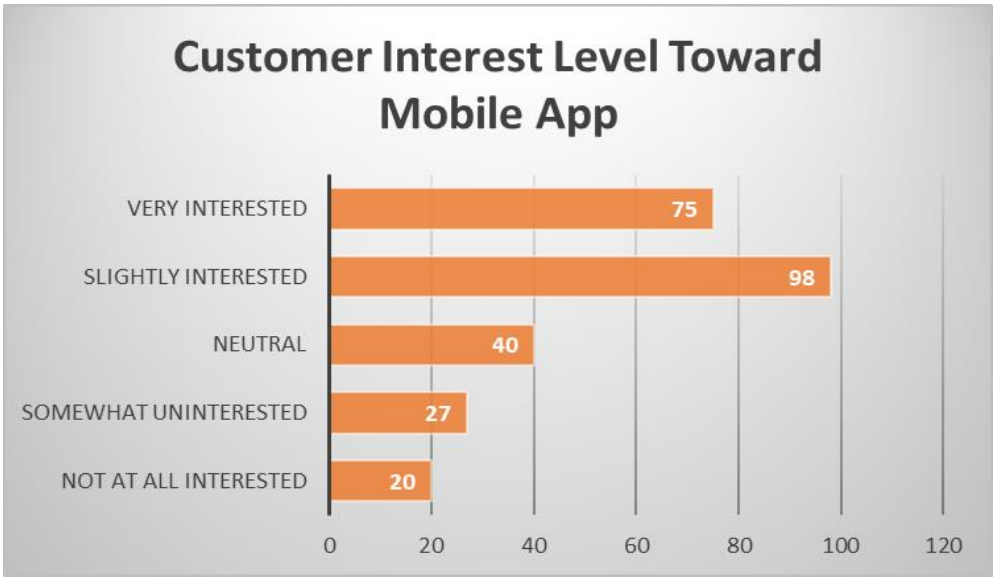



Figure 50. Customer interest level toward mobile application

#### 4.3.4.7 Summary

Table 18 sum up the obtained results from the conducted customer survey. According to the participants, the most liked technology was mobile application and the least one was waiter robot. Although it can be interpreted that no technology was neither highly favorite neither highly disliked among participants. All average values were in a close interval ranging between 2.5 and 3.5. On the other hand, the experience level of customers vary widely for each technology. Robotic technologies were almost identical with respect to experience history among participants and had the least percentages. Self-service kiosk and mobile application technologies had also similar value and almost 30% of participants mentioned they had experience for such technologies. The most used technology by participants was table-menu. Almost 80% of participants stated that they had used this technology at least one time before in restaurants and cafes. It can be said that tabletop technology in the form of touch screen table and tablet menu was the most successful technologies among all asked technologies by considering their high experience level and also their relatively high interest level.

Table 18. Summary of Obtained Results from Customer Survey

| **Technology** | **Average Value** | **Percentage of Participants who had experienced** |
|---|---|---|
| Waiter Robot | 2.77 | 9 % |
| Chef Robot | 2.97 | 8% |
| Self-Service Kiosk | 3.5 | 32% |
| Tablet-menu | 3.54 | 80% |
| Tabletop Technology | 3.65 | 65% |
| Mobile Application | 3.68 | 33% |

# CHAPTER FIVE

## CONCLUSION AND DISCUSSION

The aim of this research was to provide an insight into the current situation of technology in foodservice businesses in the city of Ankara. First, we conducted in-depth interviews with two software companies that provide technological solutions mainly for restaurants and cafes in Ankara. Next, 18 structured interviews conducted with restaurants manager and owner in Ankara in order to learn their mindset and perspective about integrating technology into their businesses. Finally, customers for restaurants and cafes in Ankara took into consideration and their level of interest about specific types of technologies asked.

Following contents can be stated from conducted in-depth interviews with technology providers companies. According to them, the availability of technological solutions for restaurants and cafes are high. This means that one can easily find and apply the desired technological solution in Turkey. They stated that such solutions and services have a significant positive effect on the performance of the business in terms of speed, control, accuracy and cost management. They believed that a lack of knowledge and educated people on the topic are the biggest barrier to the adaptation of technological solution in the sector. Moreover, they stated that recent economic crises in Turkey had a negative effect on the development of such solutions among foodservice businesses. They predicted that in coming years there will come innovations and technology for back office in restaurants and cafes. From their perspectives, robotics and artificial intelligence have the potential to be a game changer for the sector in the future.

Highlights of obtained results from conducted structured interviews with

restaurateurs and managers are as follow. It seems that although different types of POS systems and other technological solutions are applied but still traditional ways of handling stuff by pen and paper or cash register are still in use. Business growth, ease of use and providing better service for customers were the main reasons for upgrading current systems from the perspective of decision makers. Moreover, they believed that efficiency is the most important characteristics of a technological solution. Restaurant discovery and attracting new customers to the business was the most interesting topic that they wanted to see more technology about it. Social media seemed like a very interesting topic for decision makers and they wanted integration of social media for their POS systems the most, among other options for upgrade. Most of the interviewed participants felt ready for adopting new technology and most of them predicted that if they decide on purchasing, it would happen within 6 months. High prices of technological solutions were the biggest concern of decision makers. Most of the interviewed participants had either a website or a mobile application for their businesses that mainly provide general information about the businesses and services they provide. Instagram was the most favorite social media platforms among them. Electronic menu in the form of tablet was the most interesting technology among asked technologies. Although many interviewees thought robotic technology and AI can be effective for their businesses , most of the participants were not thinking similar about this topic.

Assessing the obtained result from customers shows that self-service kiosk, tabletop technology and, tablet-menu were the most liked technologies in the survey. In other studies with a similar topic, E-menu or E-table and tabletop technology were also one of the top interesting topics according to customers in the United States and Iran (Dixon et al., 2009; Torabi Farsani et al., 2016). This shows that innovations for placing orders in the form of self-service technology (SST) seem like an interesting topic for customers regardless of their nations. In our study, the first interesting technology from the customer's perspective was tabletop technology in the form of a touch screen table. Almost 75 % of customers stated that they are somehow interested in seeing touch screen tables in restaurants and cafes. Similar positive responses

observed toward the self-service kiosk. Only 19% of participants indicated they are not interested to use kiosks, which was the lowest among all asked technologies. However, a quarter of participants were neutral about seeing kiosks in restaurants and cafes. As it was mentioned before, a large number of participants were not familiar with this technology and during the collection of data process questions in regard to this technology were asked by participants several times. Tablet-menu was the next interesting technology according to participants and it was the most used technology in the past. Almost 80% of participants indicated they have already used such technology in restaurant and cafes, which was the highest among all asked technologies. The second most used technology was a mobile application.

Considering the in-depth interviews with technology providers firms and comparing them with conducted structured interviews with foodservice business owners and managers in Ankara, the following conclusion can be made. Both parties agreed on the lack of knowledge and qualified staff in the sector. This issue mentioned as the biggest challenge for developing technology for the sector in Turkey according to participants. Meanwhile, business decision makers selected lack of knowledge as the second most concern for applying technology solutions. This shows that the perceptions of technology developers firms match with the reality of the market. For this reason owner of the Company B stated that in the long term they are planning to provide a program for educating staff and managers which can be a useful solution for addressing this issue. On the topic of predictions for technological solutions in Turkey, firms stated that more back-office technologies would appear soon for the sector. From decision-makers 'perspective, inventory management and staff management (back office topics) were the second and third most selected interesting topic for technological solutions.

Moreover, both of the participants from company A and B mentioned the potential for robotic technology and artificial intelligence (AI) in the sector. It seems that decision-makers were not that much sure about the effectiveness of robots and AI technologies, at least not in the short term. Although some of them show a strong

positive reaction toward such technology, the majority were not sure about this topic. At the same time, we can observe a similar reaction from customers when they were asked about facing robotic technology in restaurant and cafes. Both waiter robots and chef robots received a very similar response and it seems that from the views of customers they were same. Most of the customer participants show neutral or no interest in seeing them in restaurants and cafes and it seems that the question of how robots and AI technologies will affect the sector will be answered within time.

There are also some interesting contents when we compare the received answers from Turkish restaurateurs and compare them with results from the study conducted by METRO GROUPS on European and Japanese restaurants owners. According to METRO's study, payment solutions and usage of technology to process customers' payment was the second most important topics in restaurants (Meier et al., 2017). On the other hand, Turkish restaurateurs showed no interest in adopting new ways for customers' payment. In fact, this topic was the least interesting topic according to obtained results from conducted structured interviews with Turkish restaurateurs. Tax payment and governmental regulation may be a factor for such behavior that seeks further research. Moreover, it seems that the acceptance of technological solutions among Turkish restaurateurs and European countries are similar to one another. According to the result of our study, almost 35% of the participants stated that they do not use technology in their businesses. This number is 40% for European restaurateurs. However, there was a huge difference on the topic of future investment in technological solutions. In the METRO GROUP study, 85% of independent restaurateurs stated that they have no intention for investment in technology in the future. On the other hand, only 10% of participants in our study mentioned that they do not feel a need for investing for technological solutions.

The final interesting fact that worth mentioning is that business decision-makers pay more attention to attracting new customers and finding new ways for customers to discover their businesses over loyalty programs and CRM (customer relationship management) systems. Literature review stated that keeping the existing

customer is always more efficient and less costly rather than finding new customers. This behavior can be explained by a lack of knowledge among decision makers or stating that they are not concerned by losing existing customers.

### 5.1 Limitations and Suggestions

One of the main objectives of this study was to learn the mind set of Turkish restaurateurs and managers about the use of technology in Ankara. Unfortunately, we could only reach a limited number of them in Ankara. Our sample represented small portion of a large population of restaurants and cafes. In addition to this limitation, the study was limited by the perceptions of the interviewees and the participants ideas who had completed the questionnaire. Moreover, the presence of the interviewer during the processes of data collection could have affected the obtained responses.

Future research may include larger sample size in order to truly investigate the existing mindset of Turkish restaurateurs and managers about adopting technological solutions into their businesses. In addition, replication of similar study in coming years needed since the advancement of digital technology is accelerating each year. Finally, future researches may try to explain factors that influence Turkish customers and restaurateurs perceptions toward robotic technology and artificial intelligence. It was observed that both parties do not show positive response toward this technology and it can be said that they were neutral in the best scenario.

## REFERENCES


Akinsoft. (2018). *Akinsoft Software Engineering Introduction Catalog*. Konya,Turkey.

Alton Towers. (2016). *What happens inside Rollercoaster Restaurant - [Video file]*. Retrieved from https://www.youtube.com/watch?v=uaS6l3XR-gI

American Hotel & Lodging Association. (2006). *Food and Beverage Systems*.

Anadolu Ajansi. (2015). Konya'daki bu kafede çay servisini robot yapıyor| NTV. Retrieved February 25, 2019, from https://www.ntv.com.tr/teknoloji/konyadaki-bu-kafede-cay-servisini-robot-yapiyor,qa4oUOCklUGMjOeuU4Q6Sw?_ref=infinite

Asif, M., Sabeel, M., Rahman, M., & Khan, Z. H. (2015). Waiter Robot – Solution to Restaurant Automation. In *The 1st Student Multi Disciplinary Research Conference (MDSRC)*. University of Wah, Pakistan,November 2015.

Atalaysun, M. (2017). *Turkey Food Service - Hotel Restaurant Institutional HRI Food Service Sector Report for Turkey*. Ankara.

Bandoim, L. (2018). How The Robot Hamburger Flipper Will Transform Food Service In Stadiums. Retrieved February 23, 2019, from https://www.forbes.com/sites/lanabandoim/2018/08/28/how-the-robot-hamburger-flipper-will-transform-food-service-in-stadiums/#7bafd9b26378

Beach, N. P. (2015). Waste oil management system. Retrieved from www.frontlineii.com

Benjamin, D. (2018). The Future of Food: The Internet of Things and the Connected Restaurant Kitchen. Retrieved February 27, 2019, from https://upserve.com/restaurant-insider/the-future-of-food-the-internet-of-things-and-the-connected-restaurant-kitchen/

Bowen, J., & Morosan, C. (2018). Beware hospitality industry: the robots are coming. *Worldwide Hospitality and Tourism Themes*, *10*(6), 726–733. https://doi.org/10.1108/MRR-09-2015-0216

Bullinger, H.-J., Neuhuttler, J., Nagele, R., & Woyke, I. (2017). Collaborative Development of Business Models in Smart Service Ecosystems. *2017 Portland International Conference on Management of Engineering and Technology (PICMET)*, (July), 1–9. https://doi.org/10.23919/PICMET.2017.8125479

Cavusoglu, M. (2015). An analysis of technology applications in the restaurant industry. *Graduate Theses and Dissertations*.

Chen, W. (2012). Multitouch Tabletop Technology for People with Autism Spectrum Disorder : A review of the Literature, *14*(1877), 198–207. https://doi.org/10.1016/j.procs.2012.10.023

Cross, J. K. (2017). *Millennials and Touch Screen Technology in the Fast Food Industry : a Narrative Inquiry Study*. University of Phoenix.

Davis, L. (2012). These 1980s robot waiters were real, but they were terrible at their job. Retrieved February 25, 2019, from https://io9.gizmodo.com/these-1980s-robot-waiters-were-real-but-they-were-terr-5904068

De Vries, J. (1994). The Industrial Revolution and the Industrious Revolution. *The Journal of Economic History*, *54*(2), 249–270. https://doi.org/10.1017/S0022050700014467

Deloitte. (2015). *Industry 4.0. Challenges and solutions for the digital transformation and use of exponential technologies*. *Deloitte*. Zurich.

Demicco, F., Cobanoglu, C., Dunbar, J., Grimes, R., Chen, C., & James R, K. (2013). *Restaurant Management: A Best Practices Approach*. *Kendall/Hunt*. Dubuque.

Dixon, M., Kimes, S. E., & Verma, R. (2009). Customer Preferences for Restaurant Technology Innovations. *Cornell Hospitality Report*, *9*(7), 6–16. Retrieved from http://scholarship.sha.cornell.edu/chrpubs

Emami-Langroodi, F. (2017). Schumpeter's Theory of Economic Development: A Study of the Creative Destruction and Entrepreneurship Effects on the Economic Growth. *SSRN Electronic Journal*, (June 2017). https://doi.org/10.2139/ssrn.3153744

Ford, R. C., Heaton, C. P., & Brown, S. W. (2001). Delivering Excellent Service: Lessons from the Best Firms. *California Management Review*, *44*(1), 39. https://doi.org/10.2307/41166110

Frontline. (n.d.). *Smart Oil Management- Frontline System Catalog*. Ohio. Retrieved from http://www.frontlineii.com/assets/pdfs/Frontline_International_Capabilities_Brochure_2014-2.pdf

Gibson, M. (2015, April 14). Meet The Robot Chef That Can Prepare You Dinner. *Time*. Retrieved from http://time.com/3819525/robot-chef-moley-robotics/

Godwin, C. (2018). Burger-flipping robot begins first shift - BBC News. *BBC News*. England. Retrieved from https://www.bbc.com/news/av/technology-43292047/burger-flipping-robot-begins-first-shift

Graham, J. (2018). Flippy the robot hamburger flipper has a new gig – at Dodger Stadium. Retrieved February 23, 2019, from https://www.cnbc.com/2018/07/26/flippy-the-robot-hamburger-flipper-has-a-new-gig--at-dodger-stadium.html

Hashimoto, A., Mori, N., Funatomi, T., Yamakata, Y., Kakusho, K., & Minoh, M. (2008). Smart Kitchen : A User Centric Cooking Support System. *In Proc. 2008 Information Processing and Management of Uncertainty in Knowledge-Based Systems*, (January), 848–854. Retrieved from http://www.mm.media.kyoto-u.ac.jp/research/doc/841/112-Hashimoto.pdf

Hawksworth, J., Berriman, R., & Goel, S. (2018). Will Robots Really Steal Our Jobs?: An International Analysis of the Potential Long Term Impact of Automation. *Pricewaterhouse Coopers*, 1–47. https://doi.org/10.1080/15374416.2013.822308

Holey, P. (2017, May 17). The Boston restaurant where robots have replaced the chefs. *The Washington Post*. Retrieved from https://www.washingtonpost.com/news/innovations/wp/2018/05/17/will-robots-replace-chefs-at-this-new-boston-restaurant-they-already-have/?noredirect=on&utm_term=.913010fa3194

Hsu, L., District, S. R. H., & City, K. (2013). Electronic-Tablet-Based Menu in a Full Service Restaurant and Customer Satisfaction -- A Structural Equation Model, *3*(2), 61–71.

Intel. (n.d.). Solution brief Next-Generation Restaurants and Bars : Smart and Connected. Retrieved from https://www.intel.com/content/dam/www/public/us/en/documents/solution-briefs/smart-connected-next-generation-restaurants-bars-brief.pdf

Ivanov, S., & Webster, C. (2017). Adoption of robots, artificial intelligence and service automation by travel, tourism and hospitality companies – a cost-benefit analysis. In *International Scientific Conference "Contemporary tourism – traditions and innovations",19-21 October*. Sofia University.

Kamal, A. (2017). Hotels, restaurants and tourism may face staff shortages. *BBC News*. Retrieved from https://www.bbc.com/news/business-39448424

Kansakar, P., Munir, A., & Shabani, N. (2017). Technology in Hospitality Industry : Prospects and Challenges. *Accepted for Publication in IEEE Consumer Electronics Magazine*, 1–6.

Kimes, S. E. (2008). The Role of Technology in Restaurant Revenue Management. *Cornell Hospitality Quarterly*, *49*(3), 297–309. https://doi.org/10.1177/1938965508322768

Kincaid, C. S., & Baloglu, S. (2008). An Exploratory Study on the Impact of Self-Service Technology on Restaurant Operations. *Journal of Foodservice Business Research*, *8*(3), 55–65. https://doi.org/10.1300/J369v08n03

Koizumi, N., Uema, Y., & Inami, M. (2011). Chewing J ockey : Augmented Food Texture by using sound based on the cross - modal effect, (July 2016). https://doi.org/10.1145/2073370.2073387

Konda. (2017). *Metro Yeme İçme Araştırması*. Turkey.

Kondratiev, N. (1935). The Long Waves in Economic Life. *The Review of Economics and Statistics*, *17*(6), 105–115.

Kuo, C.-M., Chen, L.-C., & Tseng, C.-Y. (2017). Investigating an innovative service with hospitality robots. *International Journal of Contemporary Hospitality Management*, *29*(5), 1305–1321. https://doi.org/http://dx.doi.org/10.1108/MRR-09-2015-0216

Mathath, A., & Fernando, Y. (2017). Robotic Transformation and its Business Applications in Food Industry. In *Artificial Intelligence: Concepts, Methodologies, Tools, and Applications*. https://doi.org/10.4018/978-1-5225-1759-7.ch091

McCormick, J. (2018). Why Your Restaurant Needs An Integrated Guest CRM System. Retrieved February 26, 2019, from https://pos.toasttab.com/blog/integrated-crm-systems-for-restaurants

Meier, C. D., Guigou, C., Vetterli, I., & Millar, I. (2017). *Technology use and implementation barriers among European and Japanese independent restaurateurs*.

Meuter, M. L., Ostrom, A. L., Roundtree, R. I., & Bitner, M. J. (2000). Self-Service Technologies: Understanding Customer Satisfaction with Technology-Based Service Encounters. *Journal of Marketing*, *64*(3), 50–64. https://doi.org/10.1509/jmkg.64.3.50.18024

Meyer, A. L., & Vann, J. M. (2013). *how to open and operate a Restaurant*. *Globe Pequot*. Guilford.

Moavenzadeh, J. (2015). The 4th Industrial Revolution: Reshaping the Future of Production. *DHL Global Engineering & Manufacturing Summit*, 57. https://doi.org/10.1002/adfm.201000878

Mokyr, J. (1998). The Second Industrial Revolution, 1870-1914. *In V. Castronono (Ed.), Storiadell'economia Mondiale. Rome: Laterza.*, (August 1998), 1–16. https://doi.org/10.1108/JCM-04-2015-1399

Mori, M. (2012). The Uncanny Valley: The Original Essay by Masahiro Mori. *IEEE Robotics & Automation Magazine*, *12*, 1–6. Retrieved from https://spectrum.ieee.org/automaton/robotics/humanoids/the-uncanny-valley%0Ahttps://spectrum.ieee.org/automaton/robotics/humanoids/the-uncanny-valley%0Ahttps://spectrum.ieee.org/automaton/robotics/humanoids/the-uncanny-valley

Murphy, J., Gretzel, U., & Hofacker, C. (2017). Service Robots in Hospitality and Tourism: Investigating Anthropomorphism. In *Paper presented at the 15th APacCHRIE Conference, 31 May-2 June*. Bali, Indonesia. Retrieved from https://heli.edu.au/wp-content/uploads/2017/06/APacCHRIE2017_Service-Robots_paper-200.pdf

National Restaurant Association[NRA]. (2016). Diners like food with a side of tech | National Restaurant Association. Retrieved May 29, 2019, from https://www.restaurant.org/Articles/News/Rewrite/Diners-like-food-with-a-side-of-tech

Nilsen, S., & Nyberg, E. (2016). *The Adoption of Industry 4.0 - Technologies in Manufacturing: A Multiple Case Study*. KTH Industrial Engineering and Management. Retrieved from http://www.diva-portal.org/smash/record.jsf?pid=diva2%3A952337&dswid=9006

NRA. (2016). Technology that puts the 'fast' into fast casual | National Restaurant Association. Retrieved May 29, 2019, from https://www.restaurant.org/Articles/Operations/Technology-that-puts-the-fast-into-fast-casual

Ojha, G. (2018). Employee Safety & Health . Retrieved from http://www.frontlineii.com/benefits-safety.htm

Okano, M. T. (2017). IOT and Industry 4.0: The Industrial New Revolution. *International Conference on Management and Information Systems, September 25-26*, (September), 75–82.

Owano, N. (2017). Burger robots to appear at 50 locations. Retrieved December 26, 2018, from https://techxplore.com/news/2017-09-burger-robots.html

Pantelidis, I. S. (2009). High tech foodservice; an overview of technological advancements. *CHME 18th Annual Research Conference*, (May 2009).

Preveden, V., & Tiefengraber, A. (2016). Hotel Industry 4.0 - Leveraging digitization to attract guests and improve efficiency, 19. Retrieved from https://www.rolandberger.com/en/Publications/pub_hotellerie_digitalisierung.html

Rastegar, N. (2018). *Adoption of Self-service Kiosks in Quick-service Restaurants by*. *University of Guelph*. University of Guelph.

Rifkin, J. (2012). The Third Industrial Revolution: How the Internet, Green

Electricity, and 3-D Printing are Ushering in a Sustainable Era of Distributed Capitalism. Retrieved February 27, 2019, from http://www.worldfinancialreview.com/?p=2271

Saeid, B., & Macanovic, E. (2017). Self-Service Technologies -What Influences Customers to Use Them?, (May). Retrieved from http://lnu.diva-portal.org/smash/get/diva2:1108175/FULLTEXT01.pdf

sergioatinamo. (2009). *inamo - Interactive Restaurant in London's Soho - [Video file]*. Retrieved from https://www.youtube.com/watch?v=ENFqP7A_0BI

Shamim, S., Cang, S., Yu, H., & Li, Y. (2017). Examining the feasibilities of Industry 4.0 for the hospitality sector with the lens of management practice. *Energies*, *10*(4). https://doi.org/10.3390/en10040499

Sivalingam, J. (2019). Technology is transforming the food service industry - TechHQ. Retrieved May 16, 2019, from https://techhq.com/2019/02/technology-is-transforming-the-food-service-industry/

Spence, C., & Piqueras-Fiszman, B. (2014). *The Perfect Meal: The Multisensory Science ofFood and Dining*. *wiley blackwell*. oxford.

Spence, M., & Hlatshwayo, S. (2011). *The next convergence: structural change, growth and employment in a multi speed world*.

Spyce. (2017). *Spyce Restaurant Menu*. *Spyce Food Co*. Boston.

Strauss, M. (2015). McDonald's rolls out upscale options - The Globe and Mail. Retrieved May 29, 2019, from https://www.theglobeandmail.com/report-on-business/mcdonalds-rolls-out-table-service-customized-burgers-in-upscale-shift/article26601464/

Susskind, A. M., & Curry, B. (2018). A Look at How Tabletop Technology Influences Table Turn and Service Labor Usage in Table-Service Restaurants. *Cornell Hospitality Quarterly*, 193896551879708. https://doi.org/10.1177/1938965518797080

Tanaka, H., Koizumi, N., Uema, Y., & Inami, M. (2011). Chewing jockey, (February 2017), 1–1. https://doi.org/10.1145/2073370.2073387

Tichy, O. (2011). Schumpeterian business cycles: past, present and future. *Economics & Management*, *16*, 1068–1074.

Torabi Farsani, N., Sadeghi, R., Shafiei, Z., & Shahzamani Sichani, A. (2016). Measurement of Satisfaction with ICT Services Implementation and Innovation in Restaurants (Case Study: Isfahan, Iran). *Journal of Travel and Tourism Marketing*, *33*(2), 250–262. https://doi.org/10.1080/10548408.2015.1050540

Turkish Statistical Institute. (2018). Information and Communication Technology (ICT) Usage Survey on Households and Individuals 2016. *Türkiye Cumhuriyeti İçişleri Bakanlığı*, (March), 25–26. Retrieved from http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=21779

Turkstat. (2016). *GDP shares of industreis at current prices*.

Turkstat. (2017). *Share of economic sectors in gross domestic product(GDP) from 2006 to 2016*. *Statista*. Retrieved from https://www.statista.com/statistics/457857/share-of-economic-sectors-in-the-gdp-in-nicaragua/

TurkStat. (2018). *Household Consumption Expenditures , 2017 Households allocated the highest share to housing and rent expenditures*.

Walker, J. R. (2010). *The restaurant: from concept to operation*. *Wiley & Sons, Inc*. New Jersey.

Wang, H.-Y., & Wu, S.-Y. (2014). Factors influencing behavioural intention to patronise restaurants using iPad as a menu card. *Behaviour & Information Technology*, *33*(4), 395–409. https://doi.org/10.1080/0144929X.2013.810776

Wang, Y. (2012). Designing Restaurant Digital Menus to Enhance User Experience.

Weiss, A., Bernhaupt, R., Tscheligi, M., Wollherr, D., Kuhnlenz, K., Buss, M., … Hagita, N. (2016). Social Service Robots in Wellness and Restaurant Applications. *International Journal of Social Robotics*, *10*(2), 116–123. https://doi.org/http://dx.doi.org/10.1177/1938965511434112

Weyer, S., Schmitt, M., Ohmer, M., & Gorecky, D. (2015). Towards Industry 4.0 - Standardization as the crucial challenge for highly modular, multi-vendor production systems. *IFAC-PapersOnLine*, *48*(3), 579–584. https://doi.org/10.1016/j.ifacol.2015.06.143

## Appendix A: Structured Interviews with Restaurateurs and Managers

### I. Tanıtım:

Bu anket yüksek lisans tezi kapsamında bir çalışmadır. Amacı Türkiye'deki restoranlarda otomosyon ve teknoloji kullanımını saptamak, işletmeci ve çalışanların bu konudaki düşüncelerini belirlemektir. Araştırmanın değeri, gerçekçiliği ve başarısı vereceğiniz cevapların içtenliğine bağlıdır. Zaman ayırarak çalışmamazına katıldığınız için teşekkür ederiz.

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İşletmenin adı:

Adres:

## II. Sorular:

1) Çalıştığınız yerdeki pozisyonunuz nedir?

İşletme sahibi ☐ yönetici ☐ Şef/Ahçı ☐ Garson☐ Diğer☐

2) İşletmenizi nasıl sınıflandırırsınız?

Hızlı Servis☐ Restoran/tam servis☐ Bar/gece kulübü☐ kafe/Pastane☐
Catering☐ Diğer☐

3) İşletmenizi Türkiye'de kaç şubesi var?

1 ☐ 2-5☐ 6-10☐ 11-20☐ 21-100☐ 100+☐

4) Aşağıdaki sistemlerden hangilerini kullanmaktasınız?

Kağıt-kalem ☐ Yazarkasa ☐
Özel tasarlanmış sistem☐ Garson çağrı sistemi ☐
Basit POS sistemi☐ Gelişmiş entegre POS sistemi ☐
Makinalar ve robotlar☐ bulut tabanlı sistemı ☐
Diğer☐

5) İşletmenizdeki sistemi değiştirmek için en önemli ihtiyaç hangisi olabilir?

Gelişmiş işlevsellik ☐ Kullanım kolaylığı ☐ İş hacmini arttırmak☐
Güvenilirlik ☐ Hız☐ entegrasyon☐
Daha iyi hizmet ☐ Diğer☐

6) Restorant teknolojilerinde en önemli özellik sizce nedir?

Verimlilik☐ İsteğe göre uyarlanabilirlik ☐ Güvenlik ☐
Bulut uyumluluğu ☐ Özellikler/Gelişmiş İşlevsellik ☐ Başka sistemlerle entegrasyon☐
Diğer☐

7) İşletmenizde, aşağıdaki konulardan hangilerine sektörel teknolojik yenilikler uygulanabilir?

Yeni Müşteri Çekmek/Gidiş-geliş☐ Eğlence(Müzik,Wifi,TV...) ☐ Sadakat programları ☐
Oturma & Bekleme Yönetimi ☐ Sipariş ☐ Ödeme☐
Stok/Envanter yönetimi ☐ Personel Yönetimi ☐ Mutfak☐
Paket Servis☐ Diğer ☐

8) Eğer yukarıdaki işaret edildi konulardan işletmenizi uygulanmasına ıstıyorsanız, ne zaman yukseltmeyı planlıyorsunuz?

Bir ay içinde ☐ 6 ay içinde ☐ bir yıl içerisinde ☐ 2-3 sene içerisinde ☐
Güncelleştirme istemiyorum☐

9) POS sistemini iyileştirmek için ne tür yeni özellikler ilave edilmesini istersiniz? (Eğer POS sistemi kullanıyorsanız)

| | | |
|---|---|---|
| Envanter yönetimi ☐ | İnternetten sipariş ☐ | Aylık yazılım güncellemeleri ☐ |
| Tablet tabanlı POS☐ | Sadakat programları ☐ | Bulut tabanlı POS sistemi☐ |
| Mobil-cüzdan entegrasyonu ☐ | Sosyal medya entegrasyonu ☐ | |

10) Kendinizi ve işletmenizi yeni teknolojilerin uygulamasında ne kadar hazir hisediyorsunuz?

***(ölçek: 0(çok hazırlıksız)-5(Çok hazır)***

| 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|

11) Aşağıdaki başliklarin işletmeniz için onemini değerlendirin.

a. Restaurantın keşifi/Gidiş-geliş

| 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|

Hiç Önemli Değil — Çok onemli

b. Farklı ödeme yöntemleri

| 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|

Hiç Önemli Değil — Çok onemli

c. Oturma & Bekleme Yönetimi sistemi

| 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|

Hiç Önemli Değil — Çok onemli

d. Eğlence (Görsel medya, müzik, Wifi ...)

| 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|

Hiç Önemli Değil — Çok onemli

e. Sipariş vermek yöntemi

| 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|

Hiç Önemli Değil — Çok onemli

f. Sadakat programları

| 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|

Hiç Önemli Değil — Çok onemli

12) İşletmenizde yeni teknolojilerin uygulanmasının önündeki en büyük engeller nelerdir?

Aşırı pahalı ☐ Yönetimi zor ☐ Bilgi eksikliği ☐

Yapılacak yatırımın getirisinin düşük olma ihtimali☐ Müşteri beklentisi olmaması ☐

Mevcut sistemlerle entegre olamamaları ☐ ☐ Diğer

13) İşletmenizin kendi web sitesi veya Mobil Uygulaması var mı?

Hayır☐ Evet, sadece web sitesi ☐ Evet, Sadece Mobil uygulaması ☐

Evet, hem web sitesi hem de mobil uygulama ☐

14) İşletmenizin kendi web sitesi veya Mobil uygulaması varsa, aşağıdaki özelliklerden hangilerini müşterilere sunuyor? (birden fazla seçebilirsiniz)

Işletme ve hizmet hakkında genel bilgi ☐

online rezervasyon ve sipariş sistemi ☐

Müşteri Sadakat programları ve promosyonlar ☐

Diğer☐

15) İşletmenizin sosyal medyada kendi sayfaları var mı? Hayir☐ Evet☐

Eğar cevabiniz evetse, lütfen hangileri olduğunu belirtiniz.

Facebook ☐ Instagram☐ Twitter☐ Google+☐

YouTube☐ LinkedIn☐ Diğer☐

16) Gelecekte yeme içme hizmet endüstrisi için robot ve yapay zeka entegrasyonu hakkında ne düşünüyorsunuz?

Bu mümkün ve etkili olamaz ☐

Bu mümkün ancak yakın gelecekte değil ☐

Etkili ve başarılı olduğunu düşünüyorum ☐

Bu konu hakkında hiçbir fikrim yok ☐

17) İşletmeniz için gelecekte bir e-menüyü kullanmak ister misiniz?

Kesinlikle hayir☐ Sanmıyorum☐ Belki☐ Belki evet☐ kesinlikle evet☐

18) Gelecekte işletmeniz için e-masalar kullanmak düşünüyor musunuz?

Kesinlikle hayir☐ Sanmıyorum☐ Belki☐ Belki evet☐ kesinlikle evet☐

19) İşletmenizin geleceği için robot şeflere yatırım yapmakla ilgileniyor musunuz?

Kesinlikle hayir☐ Sanmıyorum☐ Belki☐ Belki evet☐ kesinlikle evet☐

## I. Introduction: (Prepared only in Turkish version)

## II. Questions:

1) What is your role?

Owner ☐ Manager ☐ Chef ☐ Server☐

2) How would you categorize your restaurant?

Quick Service☐ Full-Service☐ Bar/Night club☐ Cafe/Bakery☐
Catering☐ Other☐

3) How many locations dose your restaurant have?

One ☐ 2-5☐ 6-10☐ 11-20☐ 21-100☐

4) What are you currently using to manage transactions and operations?

Pen & Paper ☐ Cash Register ☐
Custom-build system☐ Waiter & Customer calling system ☐
Basic POS Systems☐ Advanced integrated POS systems ☐
Machines & Robots☐ Cloud-base systems☐
other☐

5) What would be your top reason for replacing your existing method or software?

Advanced functionality☐ Ease of use☐ Business growth☐
Reliability☐ Speed☐ Integrations☐
Better support ☐

6) What is most important to you when it comes to restaurant technology?

Efficiency☐ Customizability☐ Features/Advanced Functionality☐
Integration with other systems☐ security☐ cloud-based ☐

7) Which of these technologies topics are you likely to implement in your business?

Discovery/Traffic driving☐ Entertainment☐ Loyalty programs☐
Seating &Waitlist Management☐ Ordering☐ Payment☐
Inventory Management ☐ Staff Management☐ Kitchen☐
Other ☐ None☐

8) What are the top features you would need in a POS upgrade?(If you use POS Systems in your business)

| | | |
|---|---|---|
| Inventory management☐ | online ordering☐ | Monthly software updates☐ |
| tablet-based POS☐ | loyalty and gift cards☐ | cloud-based POS☐ |
| Mobile-wallet Integration☐ | Social-Media integration☐ | |

9) When are you planning to upgrade your restaurant technology?

Within a month☐ within 6 months☐ within a year☐ I don't want to upgrade☐

10) How prepared are you to implement new technologies?

(***Scale: 1(Very unprepared)-10(Very prepared)***)

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|

11) Rate how valuable these technologies (topics) are to your business or the future of your business.

a. Loyalty Building

| 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|

Not important Super Important

b. Payment

| 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|

Not important Super Important

c. Seating & Waitlist Management

| 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|

Not important Super Important

d. Entertainment

| 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|

Not important Super Important

e. Ordering

| 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|

Not important Super Important

f. Restaurant Discovery/Traffic Driving

| 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|

Not important Super Important

12) What are the biggest obstacles to implementing new technologies into your business?

Too expensive ☐ Difficult to manage ☐ Lack of knowledge ☐

No proof of ROI (Return of Investment) ☐ They do not integrate with current systems ☐

Guest are not asking for it ☐ ☐other

13) Does your business has its own website or Mobile Application?

No☐ Yes, Just Website☐ Yes, Just Mobile app☐

Yes, both website and mobile app ☐

14) If your business has its own website or Mobile app, which one of following features does it provide for customers? (select more

General information about business and services it provide ☐

online reservation and ordering system ☐

Customer Loyalty programs and promotions ☐

15) Dose your business has its own pages in social medias? No☐ Yes☐

If yes, please indicate which ones.

Facebook ☐ Instagram☐ Twitter☐ Google+☐

YouTube☐ LinkedIn☐ Others☐

16) What do you think about implanting robots and artificial intelligence for the food service industry in the future?

It is not possible and effective☐

It is possible but not in the near future☐

It will be more effective than current situation ☐

I do not have any idea about this topic☐

17) Are you interested in using an e-menu for your business in the future?

Not at all ☐ not really☐ Maybe☐ most probably☐ absolutely☐

18) Are you interested in designing e-tables for your business in the future?

Not at all ☐ not really☐ Maybe☐ most probably☐ absolutely☐

19) Are you interested in investing robotic chefs in your business in the future?

Not at all ☐ not really☐ Maybe☐ most probably☐ absolutely☐

## Appendix B: Customer Survey

1. Cinsiyetiniz: Erkek □ Kadın □

2. Yaşınız kaç?.....

3. Ortalama olarak, restoranlara ve kafelere ne sıklıkla gidiyorsunuz?
   □ ayda bir veya daha az
   □ yaklaşık iki haftada bir
   □ ortalama olarak haftada bir kez
   □ haftada iki-üç kez
   □ haftada beş kez veya daha fazla

4. Hangisine daha sık gidiyorsunuz?
   Lokanta □
   Kebap Restoranı,Ocakbaşı □
   Dürüm, Döner vb. Satan yerler □
   Hazır yemek(Fast Food) □
   Cafe, Pastane vb □
   Bar, Club, Meyhane ,Taverna □
   Lüks Restoran □

   Aşağıda restoran teknolojileri hakkında sorular var. öncelikle bu konuda ne kadar ilgli oldunuzu soruyoruz. sonrasında bu teknolojiler hakında tecrübeniz olup olmadığnı sorıyoruz.

5. A) Garsonların yerine robot görmek ilginizi ne kadar çekiyor
   Hiç ilgilenmiyorum □ İlgimi az çekiyor □ Fikrim Yok□ Biraz ilgiliyim □ Çok ilgileniyorum □

   B) Bu teknoloji ile daha önce hiç tecrübem olmadı □
   Bu teknoloji ile daha önce tecrübe ettim □

6. A) Siparişinizin bir robot tarafından hazırlanıp / pişirilmesi ilginizi ne kadar çeker?
   Hiç ilgilenmiyorum □ İlgimi az çekiyor □ Fikrim Yok □ Biraz ilgiliyim □ Çok ilgileniyorum □

   B) Bu teknoloji ile daha önce hiç tecrübem olmadı □
   Bu teknoloji ile daha önce tecrübe ettim □

7. A) Sipariş ve ödeme işlemlerinizi kiosk üzerinden yapmak ilginizi ne kadar çeker?
   Hiç ilgilenmiyorum □ İlgimi az çekiyor □ Fikrim Yok □ Biraz ilgiliyim □ Çok ilgileniyorum □

   B) Bu teknoloji ile daha önce hiç tecrübem olmadı □
   Bu teknoloji ile daha önce tecrübe ettim □

8. A) Menünüzü tablet üzerinden görmek ilginizi ne kadar çeker?
Hiç ilgilenmiyorum ☐ İlgimi az çekiyor ☐ Fikrim Yok ☐ Biraz ilgiliyim ☐ Çok ilgileniyorum ☐

B) Bu teknoloji ile daha önce hiç tecrübem olmadı ☐
Bu teknoloji ile daha önce tecrübe ettim ☐

9. A) Restoran masanızın dokunmatik ekran olması (sipariş, eğlence amaçlı) ne kadar ilginizi çeker?
Hiç ilgilenmiyorum ☐ İlgimi az çekiyor ☐ Fikrim Yok ☐ Biraz ilgiliyim ☐ Çok ilgileniyorum ☐

B) Bu teknoloji ile daha önce hiç tecrübem olmadı ☐
Bu teknoloji ile daha önce tecrübe ettim ☐

10. A) Restoranların mobil uygulamalarını kullanmak ne kadar ilginizi çeker?
Hiç ilgilenmiyorum ☐ İlgimi az çekiyor ☐ Kararsızım ☐ Biraz ilgiliyim ☐ Çok ilgileniyorum ☐

B) Bu teknoloji ile daha önce hiç tecrübem olmadı ☐
Bu teknoloji ile daha önce tecrübe ettim ☐

1. What is your gender? Male☐ Female☐

2. What is your age?
   17 or younger☐ 18-20☐ 21-25☐ 26-30☐ 30 or older☐

3. On average, how often do you go to restaurants & cafes?
   ☐ Infrequently – once a month or less
   ☐ Occasionally – about once a fortnight
   ☐ Regularly – an average of once a week
   ☐ Frequently – two-three times a week
   ☐ Very frequently – five times or more per week

   In the following questions, there are technologies for restaurants/cafes that we want to know how you feel about them. Please first indicate the amount of interest you would have for these technologies if they provided for servicing you in the restaurant/cafe. Next, indicate whether you had the experience of using them in the past or not.

4. How much are you interested to see robots as your servant for delivering orders and greeting customers?
   Not at all interested☐ Somewhat uninterested☐ Neutral☐ Somewhat interested☐ Very interested☐
   I **HAD** experienced this technology at the restaurant/cafe in the past☐
   I **NEVER** had experience of having this technology at the restaurant/cafe ☐

5. How much are you interested to have your order prepared/assisted by a robot in the kitchen of a restaurant?
   Not at all interested☐ Somewhat uninterested☐ Neutral☐ Somewhat interested☐ Very interested☐
   I **HAD** experienced this technology at the restaurant/cafe in the past☐
   I **NEVER** had experience of having this technology at the restaurant/cafe ☐

6. How much are you interested to order and pay your order through kiosk?
   Not at all interested☐ Somewhat uninterested☐ Neutral☐ Somewhat interested☐ Very interested☐
   I **HAD** experienced this technology at the restaurant/cafe in the past☐
   I **NEVER** had experience of having this technology at the restaurant/cafe☐

7. How much are you interested to use the tablet as a menu in the restaurant/cafe?
   Not at all interested☐ Somewhat uninterested☐ Neutral☐ Somewhat interested☐ Very interested☐
   I **HAD** experienced this technology at the restaurant/cafe in the past☐
   I **NEVER** had experience of having this technology at the restaurant/cafe☐

8. How much are you interested to have a touch screen table for seeing the menu, ordering, entertainment, etc.?
   Not at all interested☐ Somewhat uninterested☐ Neutral☐ Somewhat interested☐ Very interested☐
   I **HAD** experienced this technology at the restaurant/cafe in the past☐
   I **NEVER** had experience of having this technology at the restaurant/cafe☐

9. How much are you interested to use a mobile application of restaurant/cafe?
   Not at all interested☐ Somewhat uninterested☐ Neutral☐ Somewhat interested☐ Very interested☐
   I **HAD** experienced this technology at the restaurant/cafe in the past☐
   I **NEVER** had experience of having this technology at the restaurant/cafe☐