CREATING AN OPTIMAL STRUCTURE OF WORKING TIMES AND WORKPLACE ENVIRONMENT TO MAXIMIZE THE PERFORMANCE LEVEL OF SOFTWARE DEVELOPERS IN TURKEY.

Research dissertation presented in partial fulfilment of the requirements for the degree of MSc in International Business Management

Business School, Griffith College Dublin

Dissertation Supervisor: Vlasios Sarantinos

Doga Zeynep Germen

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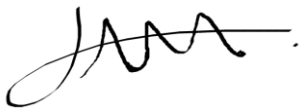
Candidate Declaration

Candidate Name: Doga Zeynep Germen

I certify that the dissertation entitled: Creating an Optimal Structure of Working Times and Workplace Environment to Maximize the Performance Level of Software Developers in Turkey

submitted for the degree of: MSc in International Business Management is the result of my own work and that where reference is made to the work of others, due acknowledgment is given.

Candidate signature: 

Date: 28th August 2020

Supervisor Name (please print): Vlasios Sarantinos

Supervisor signature:

Date: 28th August 2020

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IT	Information Technology
IEEE	The Institute of Electrical and Electronics Engineers

Creating an Optimal Structure of Working Times and Workplace Environment to Maximize the Performance Level of Software Developers in Turkey.

Doga Zeynep Germen

Abstract

In this dissertation, the main aim was creating an optimal physical office environment and working time patterns to maximize the performance levels of the software developers in Turkey. The main elements of the physical office environment were identified and handled as office structure, ergonomics of the computer workstation and dominant color of the office. The working hour patterns were identified and handles as flexibility of the working hours, duration of working hours and working at weekend and nighttime. This research had the Post-positivistic paradigm as philosophical background. To reach a conclusion and overall understanding of the mentioned concepts, a detailed literature research was made and critically analyzed and research survey was conducted with the software developers in Turkey. The survey conducted had both qualitative and quantitative features. As a result of the survey, regarding optimal physical office structure to maximize the performance level of the software developers in Turkey, it was found that an office with open office area, private personal rooms and private team rooms is the performance maximizing office structure. Additionally, a conclusion drawn as a computer workstation with ergonomic chair, desk, tools for keyboard and mouse usage and multiple monitors or a monitor with large screen and high resolution maximizes the performance level of the participants. It was found that dominant color of the office environment has not a significant effect on the participants, however, for the participants who are affected by the dominant color, the office should be white or nude colors to maximize the performance of the software developers in Turkey. With respect to performance maximizing working time patterns of the software developers in Turkey, it is found that flexibility of working hours with weekly duration of 30-40 hours is the most performance maximizing pattern. Additionally, it is concluded that working at weekend to complete the flexible working hours is a performance decreasing factor. However, this research concluded that opportunity of using nighttime to complete flexible working hours is performance maximizing element for the software developers in Turkey.

1. INTRODUCTION

This paper will be focused on the creation of the optimal physical workplace environment and working time structure to maximize the performance of the software developers in Turkey. The meaning of the 'creation' in this topic is making research to find the needs and elements to increase performance of software developers in terms of physical environment and work time schedule. Additionally, effects and optimal settings of these physical workplace environment elements and work time patterns will be examined by the help of the survey and in the light of these information, author will provide the HR departments with a proposal for a workplace environment and working time schedule to maximize performance of the software developers in Turkey.

Deniz Tiryakioğlu, who is the chairman of the boars of Turkish Informatics Association Istanbul Branch Office, stated that domestic IT (Information Technology) sector in Turkey is expected to reach 160 billion USD size in 2023 and 50 billion USD. Additionally, Tiryakioğlu stated that there are currently more than 17 thousand establishments in which 120 thousand employees work. Turkish domestic software suppliers serve for 900 thousand establishments in Turkey and foreign countries (Oksay, 2018).

Firstly, to increase the performance of the software developers in Turkey, the needed elements, their effects and setting of the elements of the physical workplace environments of the software developers in Turkey should be analyzed. The physical workplace environment has a notable effect on employees' performance (Ollukkaran, 2012). The physical environment affects the employees' job satisfaction and attitude, hence their concentration, performance and productivity (Kamarulzaman *et al.*, 2011). Also, another reason behind this notable effect is that the physical workplace environment determines employees' engagement level with their environment and work, hence their absenteeism, complaint and productivity (Leblebici, 2012). For example, if we take office structure as an example, if a of group software developers work in open-office, lack of privacy and amount of distractors may cause loss in their performance or if we take light as an example, lack of light and dimness may cause decrease in performance due to concentration problems and sleepiness. In this paper, the workplace environment means the physical elements of the workplace

which employee is surrounded with such as office structure, recreational areas, equipment, colors and lightning.

These are the questions which are going to be answered:

a) Does physical work environment have notable effect on the performance of the software developers in Turkey?

b) What are the elements of the physical workplace environment for the software developers in Turkey?

c) What are the impacts of each mentioned above physical workplace environment element to the performance of the software developers in Turkey?

d) What are the limits and setting of physical workplace elements which positively impact the performance of the software developers in Turkey?

e) What are the specific physical workplace elements with specific features which can help to improve the performance of the software developers in Turkey?

f) What suggestions can be given to the organizations and software developers in Turkey to gain an increase in their performance according to the results of this research?

After a detailed research, the optimal working environment for software developers in Turkey will be assessed and the advice will be given about the features, setting and limits of the physical workplace elements.

Secondly, the working time structure will be held. The working time structure subject is made of the two subtitles which are long times, overtime and flexible and irregular working arrangements (Croucher *et al.*, 2013). These titles will be researched to understand the effects of the working time structure or pattern on the performance of the software developers in Turkey.

The questions below will be asked and answered to create the optimal work time structure:

a) Does working time structure affect the performance of the software developers in Turkey?

b) What are the possible patterns of work time schedule for software developers in Turkey?

c) What are the current working time patterns or structures for the software developers in Turkey and how they are affected?

d) What are the impacts of the working time patterns on the performance of the software developers in Turkey?

e) What are the working time patterns which can help to increase the performance of the software developers in Turkey?

f) What suggestions can be given to the organizations and software developers in Turkey to gain an increase in their performance according to the results of this research?

After the research of the questions above, suggestions about optimal working time pattern to maximize the performance of the software developers in Turkey will be given. The reason behind choosing the title of software developer for this dissertation topic is that the profession of the author is Computer Scientist.

The physical workplace environment and the structure of the working hours are the vital elements of an organization that wants to maximize the performance of the employees (Aggarwal *et al.*, 2014). The patterns of work time schedule such as working at night time, having flexible work schedule, etc. have significant effect on employees' absenteeism, job satisfaction, attitudes and wellbeing related to their control over their own time management dependent on their personal lives and needs (Bolino *et al.*, 2020). Additionally, work time schedules have direct and indirect effects on employees' physical and mental health, hence their performance (ILO, 2019). For example, night shifts may cause physical and mental health problems to the employees due to the sleep problems, moreover long working hours may cause mental and physical health problems due to the fatigue and lack of time to spend to personal life. Thus, maximizing the performance of the software developers in Turkey could contribute the economy of the country, the profit that companies make and also wellbeing of the employees.

The aim of this research is creating an optimal working environment and working hours to maximize the performance of the software engineers in Turkey. To achieve this aim,

firstly a detailed research will be done about the main elements of physical working environment and the patterns of working hour schedules for the average employees. After that, the specific elements of the software engineers in terms of physical working environment and working hours will be identified and analyzed. Then, the effects of these elements on performance of the employees will be identified and analyzed. Afterwards, the features, limits and setting of these elements which maximize the performance of the software developers in Turkey will be determined. The information received after the research will be analyzed and critically argued. As the next step, the specific needs in terms of working environment and working hours' structure of the software engineers in Turkey will be researched and analyzed. In the light of the data collected and research done, the optimal physical environment and the working hours for the software engineers in Turkey will be created and suggested.

The topic is shaped from the profession of the author. Author's background is computer science and software development and this situation leads the author to determine the problems of the software developers in Turkey and contributing them with helping them increase their productivity level. By the help of this research, employers of the software development organizations in Turkey may arrange the physical office environment and working time patterns and increase the performance of their employees who are software developers in Turkey.

2. LITERATURE REVIEW

As mentioned in the Introduction section, being a new location of growing IT sector, Turkey has a potential to be a great market to the software developers. To increase the software developers' performance and productivity level which may provide economic gains to Turkey, the elements of the physical office environment and the work time patterns for the software developers should be examined in detail.

In this section, to provide the performance maximizing physical workplace environment and work time pattern with the software developers in Turkey, the elements and types of the physical workplace environment and work time patterns will be determined and critically evaluated with the help of the existing academic literature. Additionally, existing

literature will provide an insight to potential outcomes and results of this research. Also, the gaps in the literature specifically related to software engineers will be discovered and the contributions of this research to these gaps will be identified and analyzed.

In the first chapter, work time patterns will be identified and examined in detail. By means of secondary data, the effects of the different work time patterns on performance and productivity will be explained and critiqued.

In the second chapter, the elements of physical office environment will be determined and explained in detail. Additionally, existing literature will be researched and evaluated the effects of the elements of physical office environment on the performance and productivity of the software developers.

2.1 WORK TIME PATTERNS

2.1.1 Flexibility of Working Hours

Flexible working hours, in other words flextime, means that giving employees to arrange or schedule their time with some limitations. It is described as being at the office in specific core hours, such as 10:00 to 16:00, and arranging the remaining time due to their own preferences or adjusting their starting and leaving times (Loring Moss and Curtis, 1985). Also, it has limits which determines the earliest start and latest leaving times such as 19:00 is latest hour to leave and 7:00 is the earliest hour to start to work (Bath, 2020).

According to Article 5 of Regulation of Working Hours under Turkish Labor Act, via the written agreement of the parties, employees can arrange their work hour schedule without exceeding 11 hours of work in a day (2003). That is, if an employee has a right to arrange his/her working hours flexibly, he/she must present in the office in core working hours which is adjusted by the employer and same for each employee and out of that core hours an employee can arrange his/her starting and leaving hours without exceeding 11 hours of work in a work day.

Flexible working hours is a very prevalent working hour pattern among high level industries with high paid employees such as information services which %75 of the organizations have flextime arrangement and technical, professional and scientific services which 70% of the organizations have flextime arrangement (CIPD, 2019).

However, the reason behind this commonness of flexible working hours should be examined. It is suggested that arranging working hours flexibly enhance the loyalty of the employees which indirectly increase the level of productivity and performance because it provides the employees with better work-life balance (Altındağ and Siller, 2014).

Then, the reason behind the fact that it is more common in among information, technical, professional and scientific services should be analyzed. According to the article "What Predicts Software Developers' Productivity?", managing the time autonomously, in other words arranging working hours flexibly for an employee, increases the productivity of software developers than the employees of different kinds of jobs (Murphy-Hill *et al.*, 2019).

In an article of International Labor Office about the relationship between working time arrangements and productivity, author Lonnie Golden mentions the reasons why an employer should provide flexible work time pattern is to increase the performance and productivity of the employees, such as avoiding the lateness and misuse of sick-leave due to the responsibilities or needs in personal life, arranging their work schedule according to their needs and responsibilities in personal life and to increase work-life balance (2012).

Additionally, one research which was held with IT employees concludes that flexible work time pattern contributes to the health and the work-life balance of the employees thus it increases their motivation, performance and productivity on their work (Goudswaard et al.,2012).

Therefore, it can be seen from the scientific researches that flexible working hours may have positive effect on the software developers' productivity and performance. However, it may cause some problems which may decrease the performance and productivity level of the employees. For example, it is propounded that flexible work time arrangements

may lead to less interaction and information flow among the employees which causes decrease in productivity level of the employees due to the different schedules of each employee (Owen, 1977).

In the light of these literature collection above, there can be concluded that on the one hand, flexible working hours may cause increase in the productivity of software developers due to the better work-life balance, on the other hand it may cause decrease due to the isolation from the co-workers and reduced collaboration possibility. However, there is lack of literature which covers the effects of flexible working hours on the Turkish software developers and whether they prefer flexible working hours.

2.1.2 Duration of Working Hours

Before the modern limitations of working hour durations, in the 19th century and before, the average working hour was from 12 hours to 14 hours daily (Bauer and Maylander, 1919). After the cotton-goods manufacturers Robert Owen and John Fielden started the 8-hour work day movement by 1815 due to maintain the productivity of the employees to make them perform better in lesser hours and reducing the fatigue of the employees (Dolton, 2017).

After that movement of 8-hour daily work hours' movement, Ford Motor Company adopted the idea of 8-hour daily work firstly in 1926 for providing its employees with increased work-life balance and maintained productivity level with more performance in 5 days 40-hour week (History.com Editors, 2009).

After the adoption of 8-hour daily work and 40-hour 5-day work per week by Ford Motor Company, the regulation has reached until 21st century from the beginning of 20th century. In the Turkish Labor Code dated 2003, article 63(1) states that maximum weekly work limit is 45 hours and article 63(2) states that maximum daily work limit is 11 hours.

Additionally, it is suggested that there does not have to be a causation between daily or weekly long working hours and increased amount of output. Oppositely, long weekly and

daily work hours cause increased stress and fatigue for the employees, and thus, accidents, faults and health issues may occur and cost more to the employers (Pencavel, 2015).

However, as mentioned above, the 8-hour work regulation is not based on any research or scientific evidence which aims to maximize the performance and productivity level of the employees. The 8-hour regulation is based on an assumption or a hypothesis that decreasing 12 to 14 work hours to 8 hours would maintain the productivity and performance of the employees in lesser time. Therefore, modern scientific researchers' suggestions about the duration of weekly or daily working hours to maximize the performance and productivity level of the employees should be examined.

According to an article of Harvard Business Review, 8- hour work per day is a waste of time. According to the references of the author, 6-hour work per day is more productive than 8-hour work because of the limits of human brain. Average human can work in focused, continuous and undisturbed way for 3 to 4 hours and there is no realistic background to staying more in office or work which is not cause more performance and production. Additionally, article mentions an experiment that 6–hour work per day with optimized work load to the employees results in more qualified and increased amount of work done (Glaveski, 2018).

When it comes to the weekly working hours, a research suggests that 4 work days in a week with 8hour work in a day is very hopeful and without reducing the productivity and performance level of the organizations, 32-hour work per week may increase the work-life balance and satisfaction level of the employees (Haar, 2018). As one of the organizations in New Zealand, Perpetual Guardian announced that they adopted the 4 day and 32 hours work week as company policy after 6 weeks of trial period and they reported that organization's productivity level is maintained with more satisfies employees with better work-life balance (NZWRI, 2018).

When it comes to software developers, 8-hour daily work may be not enough. According to research conducted by The Institute of Electrical and Electronics Engineers (IEEE), software developers reported that the average daily time spent in work is 9 hours including 44 minutes of break times and it is measured by the computer interaction time

tracking that average work time of the software developers in 8.5 hours per day (Meyer *et al.*, 2019).

In the light of above-literature collection, it can be concluded that long working hours cause decrease in performance and productivity of employees. However, the description of long hours is not provided thus the limits of the long hours mentioned cannot be identified. Additionally, it can be seen that there are several different approaches on the duration of the weekly or daily work hours which aims to increase the productivity level of the employees. However, there is lack of literature which covers the working hour duration limits of software developers in Turkey to increase their productivity and how duration of working hours affect the performance of Turkish software developers.

2.1.3 Working at Weekend and Nighttime

2.1.3.1 Weekend

According to data of Bureau of Labor Statistics, 34% of the employees work on weekends (2015). Additionally, according to 2017 research suggests that 58% of the newly graduated employees in U.S., 48% of France and 49% globally consider acceptable and are flexible to work at weekends and nights (Lyons *et al.*, 2017).

However, according to an article, working at weekends may cause loss of productivity related to reluctant work while their family and friends are socially interacting and resting (Bryson and Forth, 2007). Additionally, according to a research working at Sundays as both shiftwork or overwork may cause more accidents in work and more health problems due to the decrease in work-life balance (Wirtz *et al.*, 2011). Another study indicates that working more hours in weekends causes mental health problems almost double of the employees compared to weekday overtime and this situation is linked to the negative work-life balance (Sato *et al.*, 2020). Additionally, it is reported that working at weekends may cause higher level of stress on employees and their family due to the adaptation problems of their spare time and family activities (Goswami, 2012).

Considering the findings and suggestion above, working at weekends may cause crucial performance decrease in employees because the time when employees feel more

productive is the time when they feel positive and they are happy with their life (Gino and Staats, 2015).

On the other hand, each and every employee have their own specific working arrangements, schedules and times periods which they are most productive. When it comes to software developers, one third of them have atypical work time patterns which they have good performance such as weekends (Claes *et al.*, 2018).

In the light of the collection of literature and secondary data above, it can be seen that working at weekends may reduce the performance and productivity level of the employees due to the negative work-life balance. Regular work time pattern allows employees to have spare time at weekends, that is Saturday and Sundays, and the shift workers who work in weekends may not have an opportunity to spend time with their friends and family due to the opposite patterns of work time. This situation most probably reduces their satisfaction due to the negative work-life balance and that may lead to reduce in their performance and productivity in their jobs.

However, it is also argued that there may be a difference amongst employees' most productive periods of the week, some employees may be more productive on weekends and thus, they may want to use their working time partially or wholly on weekends. However, there is a lack of literature which covers the preferences of software developers in Turkey who may want to complete a part of their weekly working hours on weekends. Additionally, there is also lack of evidence which try to answer how working on weekends affect the performance and productivity of software developers in Turkey.

2.1.3.2 Nighttime

The average employees may work usually 9:00 to 17:00, however, for night persons, who are more productive on the nights, working on the day time may reduce their performance level and their productivity level (Facer-Childs *et al.*, 2019).

According to a study, even though the percentage of the population who are more productive in day time is approximately 18%, the population who is more productive and perform better at night is approximately at the percentage of 27% and the remaining

percentage is in the middle (BaHammam *et al.*, 2011). Additionally, being more productive on the night time or day time is not a choice. According to a research, it is found that our genes designates our productivity level in the different periods of the day (Rosenberg *et al.*, 2014). That is, 27% of the population is more productive on the night time due to their heritage.

On the other hand, working at night causes disruptions on human Circadian Rhythm which causes sleep disorders and fatigue which leads to moodiness, reduce in cognitive performance and tendency to diseases (Price, 2011). Additionally, National Population Health Survey finds that employees working at night face several pyscho-social problems due to the impairment of Circadian Rhythms and social isolation (Shields, 2002). Another study also finds that due to the Circadian Rhythm problems due to working at night cause cognitive performance impairments (Kazemi *et al.*, 2006). The decrease in cognitive performance, which is caused by night working, includes decrease in attention, information processing and visual-motor performances (Chellappa *et al.*, 2019).

According to National Institute of General Medical Sciences' description of Circadian Rhythm is "physical, mental, and behavioral changes that follow a daily cycle. They respond primarily to light and darkness in an organism's environment. Sleeping at night and being awake during the day is an example of a light-related circadian rhythm." (Subbaramaiah, 2020).

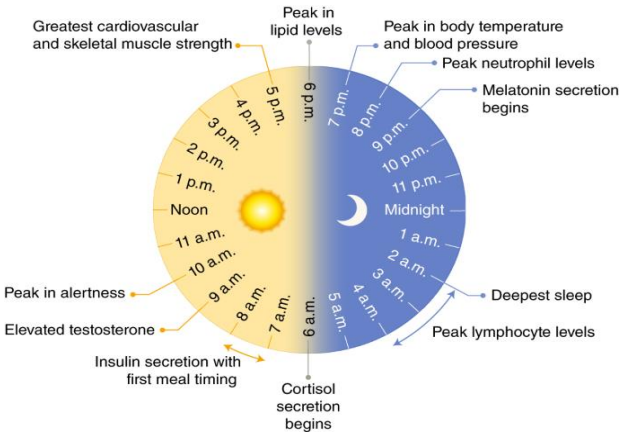

Figure 1 Human Circadian Rhythm (Masri and Sassone-Corsi, 2018)

Considering the description of Circadian Rhythm, it is argued that working at nighttime harms Circadian Rhythms, performance efficiency, social life, sleep, mental health and several bodily diseases, thus, night shifts and night time working generally causes faults and errors during work because of the Circadian Rhythm and sleep problems. (Harrington, 2001). However, as opposed to the information above, one study finds that employees who work for proper amount of consecutive days at night may adapt their rhythm on night work (Kazemi *et al.*, 2018).

In the light of the collection of the literature above, it can be concluded that there are several health problems, which are very likely to cause decrease in productivity and performance of the employees, due to the disruption of Circadian Rhythm on employees who work at night time. However, it can be ignored that there is high rate of population who are more productive and perform better at the night time. It is known that flexible work time have limitations such as latest leave hour and earliest enter hour which does not allow the employees, who perform better at night, to work at the time period of their highest performance and productivity. In this research, the gap in the literature about the rate of the Turkish software developers who perform best at night time and prefer to complete their tasks at night time will be filled and answered.

2.2 PHYSICAL WORKPLACE ENVIRONMENT

Appropriate working conditions/environment/good equipment/ tools/physical space/quiet motivates (one of the Motivators) software developers and Five studies reported that productivity is affected by motivated/ de-motivated engineers. (Beecham *et al.*, 2007).

2.2.1 Office Structure

2.2.1.1 Open Office

Open office is invented to increase the productivity and performance by collaboration and interaction between employees by lowering or fully removing the walls, doors and other types of verges (Bernstein and Turban, 2018). Thus, the purpose behind the ‘open office’ idea is increased productivity but it should be reconsidered whether it reached this goals in practice, especially for software developers.

According to the findings of the survey in article 'The Effect of Work Environments on Productivity and Satisfaction of Software Engineers', software developers who work in open offices are more prone to communicate with each other and learn from the co-workers and this situation helps them to feel more productive (Johnson *et al.*, 2019). Another study also suggests that the information share between software developers increase the performance and the productivity and the relation between information share and productivity is strongly linked (Murphy *et al.*, 2019).

Additionally, it is also argued that software development is a job that requires high level of collaboration and working closer to the project team with ability of discussion and information shared in an open office provides the software developers with more satisfaction and productivity (Johnson et al., 2019). Besides, being closer to the team members and in an open area provide the software developers with more output due to information flow and less likeliness to be distracted by unnecessary or unrelated information flow of the other teams (Jensen *et al.*, 2008).

On the other hand, even though the open office structure is suitable for the software developers as mentioned above, due to the easy information flow and communication, in a research it is found that the communication between employees may cause distraction and the participants of this research indicated their need to environment with less disruptive stimuli (Fagerholm *et al.*, 2015). However, even though the boundaries, which block the information flow and reduce the communication and collaboration level between the employees, is reduced or removed, open offices highly tend to cause concentration problems and distraction to employees which may cause productivity and performance problems, but cubicles may provide the employees with more privacy and more concentration (Clayton,2012).

In other respects, as a type of open office, cubicles also may not provide the employees with enough vocal privacy. In a survey, 60% of the employees who work in cubicles and 50% of the employees who work in unseparated open office are not happy with the office structure related to distracting vocal stimuli; furthermore 30% of the employees who work in cubicle and 25% of the employees who work in unseparated open office reported that they are not satisfied with their office's noisiness degree (Kim and de Dear, 2013).

In the light of these information collected from secondary data above, the conclusion can be drawn as open offices are highly suitable for software developers to increase their productivity and performance. However, according to several secondary researches, open offices are highly prone to cause concentration problems on employees due to the noisiness and sound pollution. Additionally, there is no evidence about how software developers are affected from the open office environment regarding their productivity and performance.

2.2.1.1 Private Room

It is known that one of the most important needs of a human being is privacy (Bernstein and Turban, 2018). In one research, due to the fundamental need of privacy in human beings, it is found that physical privacy and psychological privacy leads to a better performance and productivity level in employees resulting from increased job satisfaction (Sundstrom *et al.*, 1980). Another study suggests that privacy is the one of the indicators of increased productivity and there should be a private office for each employee who works in technical staff (Boehm *et al.*, 1984). It is also argued that, rather than the other types of office structures, private offices increase the employees' performance and productivity level due to privacy, lack of both sound and visual distractions and opportunity for employees to control their own environment (Haynes *et al.*, 2017).

The findings in a study which support the arguments above, concluded that the ambient noise in the open office structure causes dissatisfaction in the employees, which is due to the difficulty of concentration to their work, and that dissatisfaction reduces their performance and productivity (Cone and Gregory, 2006).

In a research, it is found that 67% of the employees personalize their environment with their personal items such as photographs and the other desk items; however, in the open office layouts, the percentage of employees who personalize their environment decreases (Johnson *et al.*, 2019) and it may reduce their productivity.

On the other hand, one survey founds unexpected results. While they were expecting to find that private office structure would be preferred by the software developers to increase their productivity, only 44% of the employees stated that private room is very important

although 70% of the employees stated that working in interruption and distraction free environment is very important (Storey *et al.*, 2019).

In the light of the literature review about the relationship between private room and employees' performance and productivity, it can be concluded that private room may increase the performance productivity due to privacy and avoidance of distractive stimuli. However, there is lack of evidence which covers the rate of the software developers in Turkey who works in private offices and whether they prefer to work in private offices considering their performance and productivity. Additionally, there is lack of evidence which answers how productivity and performance level of the Turkish software developers may be affected from having private office.

2.2.3 Ergonomics

As the key elements of the software development office environment, an ergonomic chair, enough amount of computers, and other technical tools such as servers, connection (Boehm *et al.*, 1984) providers and printers must be provided to the employees to maintain and increase their performance and productivity. The State of Queensland mentions in its reports that computer stations should include the adequate equipment which allow employees to work properly, including but not limited to adjustable and comfortable chair which help them reduce their fatigue, desk with adequate height, depth and area and lastly technical tools such as adequate computer parts, laptops and other desktop tools (2012). When the importance of ergonomics on their performance is asked to the employees, 71% of the employees stated that comfort of the furniture setup have significant effect on their performance and productivity (Ravindran, 2019).

A high rate of employees/employers cannot predict that the faulty design of their computer station may cause significant health problems (UNC, 2020). As a job which requires long sitting hours in front of the computer, it is reported that 77.5% of the software developers have recurring musculoskeletal health issues and if it's not coped in early phases, it may cause an economic damage related to performance and productivity loss of the employees (Maruthappapandian *et al.*, 2019). According to a research, ergonomics problems

in the office of Ghana National Petroleum Corporation causes performance and productivity loss on the employees (Kingsley, 2012).

In addition to the chair and desk, it is argued that computer workstations should provide software with healthy environment to their upper body. The tools such as keyboard and mouse should be placed and additional tools should be used to maintain hand and arm health but it is found that 40% of the employees are using or have that proper environment (Khan *et al.*, 2012). According to a survey about the ergonomics of computer work stations, it is found that 53% of the employees used keyboard wrist support tool, 55% used mouse wrist support tool and half of the employees had never used keyboard or mouse wrist support (Shikdar and Al Kindi, 2007).

In the lights of the existing literature, it can be concluded that ergonomics for the employees who work on a computer station is significantly important issue to maintain and increase the productivity and performance level. In addition, it can be concluded that a number of employees who work on computer stations have not proper elements of ergonomic workstation. This research will focus on to find whether software developers in Turkey have adequate ergonomic workstation in their offices and how their workstations' ergonomics affects their productivity and performance.

2.2.4 Dominant Color of the Office

The environment, including the color of their office, may have effect on the performance of the employees. The appropriate usage of the colors in an office can provide a better interaction between employees and environment. Colors may affect people's mental state and create an impression on their environment, and thus, colors are counted as effective environmental component for the employees' mental state and consequently their productivity (Marberry & Zagon, cited in Ozturk 2010).

It is also stated that there is a relation between the memory abilities and the color choices of the environment. According to the article, 'The Influence of Colour on Memory Performance: A Review', color of the environment has a possible effect on increasing

people's memory on environmental stimuli but this memory increase can be manipulated by the choice of color performance (Dzulkifli and Mustafar, 2013).

When it comes to selecting the colors of an office to increase the productivity and performance of the employees, it is suggested that bright colors are more prone to cause distractions and should not be chosen in the office environment and the most convenient colors are stated as paler and more pastel colors such as pale blue-green, light green, pale yellow, light gray, sandstone, beige etc. (Marberry, cited in Ozturk 2010). This choice aims to decrease the level of distraction and increase the focus on the work.

The jobs which require critical/serious concentration, such as software development, require a neutral color scheme. The jobs such as accountancy and advocacy require a stronger color scheme, while journalists would over perform in enthusing and energetic colors with high contrast value (Augustin, 2015).

At the same time, O'Brien indicate that a blue office is ideal for focusing and concentrating on numbers, green is one of the best options for a management office because of its balancing effect and yellow is appropriate for sales offices (2007). For these reasons, this is so important to choose the color scheme for a workplace. The preference must be made with suitable consideration to enhance quality of work. If improper colors were preferred, employees might experience some negative state of mind or symptoms such as stress, depression, distractibility or boredom (Kamarulzaman *et al.*, 2011).

Another research about cognitive effects of color green finds that using color green in the environments such as office and home boosts creative thinking (Augustin, 2020) thus it will probably lead to increased productivity and performance.

One of the studies suggests that red is the color that reduce the performance of the people because people unconsciously relate red with danger of failure that causes avoidance motivation and it is found that red unconsciously decreases the performance of testers who takes IQ tests (Elliot *et al.*, 2007).

On the other hand, one study suggests that color effects are personal and changes people's personality and preferences. That is, one color may increase one employee's

productivity but not another employee's. Therefore, study concludes that it is impossible to fulfill each employee's color expectations but office environment can have flexibility for different colors which can satisfy each employee (Kwallek *et al.*, 1988).

According to the existing literature review above, it can be concluded that color of the office environment has an effect on the employees' performance and productivity. However, researches and secondary data are not sufficient to decide which color affects especially software developers'' performance positively and which color not. Besides, there is an uncertainty about whether a color affects the majority of the employees in the same way or it is completely personal. Additionally, there is lack of literature which covers the performance and productivity effects of the color of the office on the software developers in Turkey and the office color preferences of software developers in Turkey to increase their performance and productivity.

This literature review about the elements of the physical elements of the office environment and work time patterns gives an insight to the idea of how employees' and software developers' performance and productivity may be affected by them. However, there is a lack of evidence about how software developers in Turkey affected by those elements that are mentioned above. Additionally, there is an uncertainty about how each element may affect the software developers' productivity and performance levels. To fill these gaps, this research focuses on to understand and draw a conclusion about how physical elements of the office environment and different work time patterns, which affect the performance and productivity levels of the software developers and how to arrange them to maximize the productivity and performance levels of the software developers in Turkey.

2.3 CONCEPTUAL FRAMEWORK

This conceptual framework illustration above represents the elements and variables in this research which are decided, collected and analyzed after a detailed literature review.

There are two main headings which are Working Time Patterns and Physical Office Environment to analyzed and determined considering the effects on the performance level of the software developers in Turkey. These two main heading will be studied and analyzed to determine whether these concepts affect the performance level of the software developers in Turkey. Also, the elements of these concepts will be designated and the elements and subheadings of the both main headings' effects on the software developers in Turkey will be analyzed. Additionally, the arrangements and the features of the elements of the main headings which increase the performance level of the software developers in Turkey will be found.

One of the two main headings to be analyzed is Work Time Patterns of the software developers in Turkey. Working Time Patterns heading will cover the performance effects of the weekly duration of the work times, the flexible working time pattern and working at weekends and nighttime on the software developers in Turkey. To analyze the effects of the Work Time Patterns on the software developers in Turkey, a survey with qualitative and quantitative questions will be conducted and results will be interpreted. According to results of the research survey, the effects of the Work Time Patterns of the software developers in Turkey on their performance will be identified and examined. If it is found that the Work Time Patterns have an effect on the participants, the features and the arrangements of the elements of the work time patterns which can increase the performance level of the participants will be determined. The elements or the subheadings of the Work Time Patterns will be discussed as Flexibility of Working Hours, Duration of the Working Hours and working at Weekend and Nighttime.

Firstly, to determine if flexible working hour pattern have an effect on the performance level of the software developers in Turkey, several survey questions with qualitative and quantitative features will be asked to the participants who are software developers in Turkey, will be conducted. After sufficient amount of participant response is

collected, the results related to the performance effects of flexible working hours on the participants will be analyzed and interpreted, the conclusion will be drawn.

Besides, to determine the duration of the weekly working hours' effect on the software developers in Turkey, survey with qualitative and quantitative survey questions will be asked to the participants. Regarding the results of the survey, the optimal duration of weekly working hours considering the daily optimal duration of working hours will be determined to maximize the performance level of the participants.

Lastly, the performance effects of the using the weekend or nighttime to complete their flexible weekly working hours on software developers in Turkey. To determine the performance effects of using the weekend or nighttime to complete the weekly working hours, qualitative and quantitative questions will be asked to the participants. According to results of the survey which have multiple choice and open ended questions, a conclusion will be drawn regarding whether working at weekend or nighttime increase the performance levels of the software developers in Turkey or not.

The other main heading is Physical Office Environment which should be studied to understand it's performance effects on the software developers in Turkey. To understand the whether physical office environment have an effect on the performance level of the software developers in Turkey, a survey with multiple choice and open ended questions will be given to the participants. For deeper understanding about the effects of the physical office environment on the software developers in Turkey, the elements of the physical office environment will be divided into 3 subheadings which are Office Structure, Ergonomics of the Computer Workstation and Dominant Color of the Office.

Firstly, by the help of a survey, participants will be asked about the effects of the two different office structures on their performance at work. The survey questions will include both open ended and multiple choice questions about the private rooms and open offices. The results of the survey will be analyzed and a conclusion will be drawn. If there will be other types of office structures which will be offered by the participants, these types of office structures will be discussed. In the light of the research results, a conclusion will be drawn.

Secondly, the Ergonomic of the Computer Workstation considering the performance effects on the software developers in Turkey will be discussed under the heading of Physical Office Structure. The open ended and multiple choice survey questions will be asked to the participants to understand whether there is an effect of ergonomics of computer workstation on the participants or not and the tools and equipment which can increase the performance of the participants will be identified. According to the results of the survey a conclusion will be drawn about the effects of the Ergonomics of Computer Workstation which increases the performance level of the participants.

Lastly, the Dominant Color of the Office considering the performance of the software developers in Turkey will be discussed. To examine and identify whether dominant color of the office environment have an effect on the software developers in Turkey and what are the colors which can increase the performance level of them. To reach that goal, a survey with multiple choice and open ended questions will be given to the participants and results will be analyzed. According to the results of the research survey, a conclusion will be drawn, considering the effects of the dominant colors of the office on the performance level of the participants and performance maximizing features and arrangements of this issue will be discussed.

3. METHODOLOGY

3.1 Research Paradigm

This section will explain the philosophical background of this thesis which is with the title of "Creating an Optimal Structure of Working Times and Workplace Environment to Maximize the Performance Level of Software Developers in Turkey" in detail.

The main aim of this research is to find the environmental parameters which are affecting the performance of the Software Engineers in the Turkey and adjusting them to maximize the developers' performance.

To find these parameters and finding their effects on the software developers in Turkey, a data set will be collected by applying survey and questionnaire on the related participants and their answers will be analyzed.

The data which will be analyzed and the result from this analyze will consist of subjective answers of the participants. Each participant will be asked about their personal perceptions, opinions and effects of the working environment elements and work hour patterns.

However, even though their perceptions, opinions and realized effects about working environment elements and work hour patterns will be highly subjective, there will be neurological and biological backgrounds of their answers which may not be possible for the participants to be aware by themselves without scientific examination. For example, according to an article Impact of Working Hours on Sleep and Mental Health, because of the sleep deprivation in the people who work long hours (>48 hours per week), they become more prone to mental disorders such as depression and anxiety (Afonso *et al.*, 2017). Therefore, their personal answers will consist of subjective aspects, as much as objective aspects.

In the light of these information, from the perspective of philosophical approaches, this thesis cannot be fully defined as positivistic or phenomenological. Therefore, the thesis should be evaluated by considering the scale which is between positivistic approach and phenomenological approach.

To compare this thesis regarding to the philosophical approaches which are positivistic approach and phenomenological approach, these parameters shown below in Figure 2 should be compared and evaluated.

Features of the two main paradigms	
Positivistic paradigm **Realist**	**Phenomenological paradigm** **Interpretivist**
• Researcher seen as objective • Deductive • Tends to produce quantitative data • Uses large samples • Concerned with hypothesis testing • Data is highly specific and precise • Studies replicated • The location is artificial • Reliability is high • Validity is low • Generalises from sample to population	• Researcher seen as subjective • Inductive • Tends to produce qualitative data • Uses small samples • Concerned with generating theories • Data is rich and subjective • Studies unique • The location is natural • Reliability is low • Validity is high • Generalises from one setting to another

Figure 2. Features of the two main paradigms (Keogan,2020)

One of the features which fall to the side of Positivistic Paradigm is that the researcher is completely objective in this research. Secondly, this thesis is inductive which means it will generalize the results and statistics, which are taken from a proportion of software developers in Turkey, to the whole software developers in Turkey. Additionally, this research should be both quantitative and qualitative to reach a meaningful conclusion. Also, the more data are collected, the more meaningful and supportable results will be. Also, the location can be counted as artificial because the participant will be asked to imagine and think the working hours and office environment elements which suits them best to increase their performance.

On the other hand, the data collected will be rich and subjective, because the answers will be given from the perspective of each separate participant which falls to the side of Phenomenological Paradigm. Additionally, this thesis will be generating theory rather than being concerned with hypothesis testing.

To make the comparison broader, this Figure 3 below will be helping to make a conclusion about the paradigm of the research.

Metatheoretical Assumptions	Positivism	Interpretivism
Ontology	Person (researcher) and reality are separate. (Dualistic)	Person (researcher) and reality are inseparable (life-world).
Epistemology	Objective reality exists beyond the human mind.	Knowledge of the world is intentionally constituted through a person's lived experience
Research Object	Research object has inherent qualities that exist independently of the researcher.	Research object is interpreted in light of meaningful structure of a person's (researcher's) lived experience
Method	Statistics, content analysis	Hermeneutics, phenomenology
Theory of Truth	Correspondence theory of truth: one to one mapping between research statements and reality.	Truth as intentional fulfilment: interpretation of research object matches lived experience of object.
Validity	Certainty: Data truly measures reality	Defensible knowledge claims.
Reliability	Replicability: research results can be reproduced.	Interpretive awareness: researchers recognise and

Figure 3. Two Main Research Paradigms (Yazis and Ali Basah, 2020)

Firstly, as mentioned above, this research will be partly Dualistic but cannot be defined fully as Dualistic. Also, the epistemology of the research cannot be defined easily because of the fact that there will be aspects which is highly related to neuroscience and biology of human beings. Additionally, research object will be fully separate from the researcher. The method will be consisting of survey and questionnaire to provide researcher with statistics. Also, the research will be trying to approach the certainty with the statistics of collected data.

In the light of these conclusions, this research falls to the side of Positivism, but does not fully suitable to that paradigm.

To make it broader more, this research will be evaluated with the information provided from the figure below.

	Positivism-oriented		Interpretivism-oriented	
	Positivism	Post-positivism	Interpretivism	Constructivism
Ontology: What is reality?	Naïve realism. Objective reality.	Critical realism. Reality is imperfectly apprehendable.	Subject and object are dependent. The real essence of the object cannot be known. Reality is constructed.	
Epistemology: How do you know?	Dualism researcher-research. Replicable findings are "true". Reality can be explained.	Dualism is not possible. Replicated findings are "probably" true. Impossible to fully explain reality.	Knowledge is interpreted. Reality can be understood.	Knowledge is constructed. Reality can be constructed.
Methodologies: How do you find it out?	Experimental, deductive. Mainly quantitative. Relationship cause-effect. Statistical analysis.	Experimental. Mainly quantitative methods, manipulative. Scientific Community plays an important role of validation. Statistical analysis. Probability sampling.	Interpretation. Mainly qualitative methods. Purposive and multipurpose sampling.	Mainly qualitative methods. Purposive and multipurpose sampling. Stakeholders involvement.

Figure 4. Four Types of Research Paradigms (Iofrida *et al.*, 2014)

According to Figure 4, Post-positivism is more suitable than Positivism. Because for this research, the reality will not be fully explained and there will be no 'objective reality' but there will be 'critical realism'. Also, as mentioned before this research is not Dualistic fully because of the fact that Dualism is not possible and anything cannot be fully separable from the reality. However, both quantitative and qualitative methods will be used. Thus, lastly, the paradigm of this research is Post-positivism.

Additionally, according to Maninder Singh Setia (2016), Cross-sectional research design described as collecting data once, not for a while as in the Longitudinal Studies and it is used for population-based surveys. Therefore, this study will be a cross-sectional research because of the fact that the research design fits the description of the cross-sectional researches.

Lastly, in the light of these information, Research Onion is provided below in Figure 5.

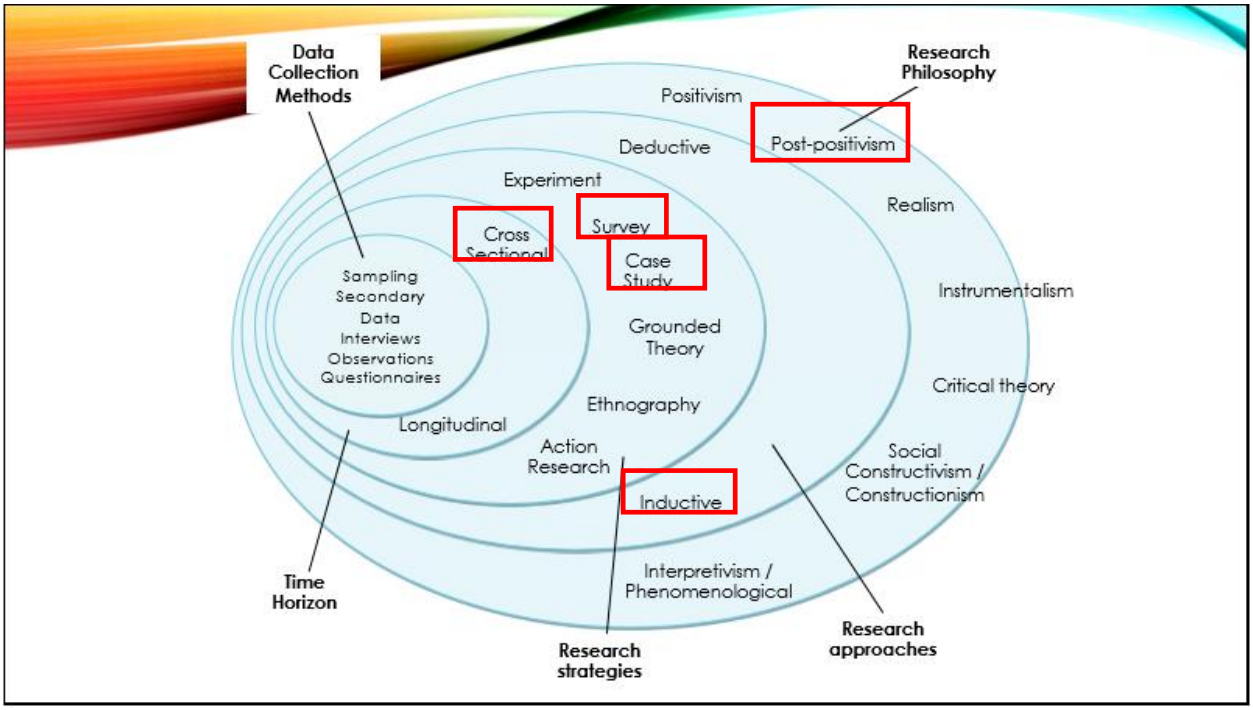

Figure 5. Research Onion (Keogan,2020)

3.2 Research Design

In this part of the paper, there will be detailed information about the strategy of the research, methods for collecting data and sources of data, nature of data, access and research ethics and research techniques.

3.2.1 Research strategy

This research will be examining the physical factors which affect the performance of the software developers in Turkey and by the help of the examination, creating an optimal working environment to maximize their performance. The participant who are software developers in Turkey and mostly Irish will be subjected to a mix of survey and questionnaire about their physical performance indicators in their office environment and how they affect them. After wide range of data is collected, a statistic will be created regarding the answers of the developers. After, those procedures, these statistics will be interpreted and received a

result about how working environment and working hours should be to maximize the performance of software developers in Turkey.

Additionally, secondary data will be collected about neurological and biological aspects of the issue about the effects of physical factors of the office environment on software developers in Turkey. These secondary data will be collected because of the fact that there would be no opportunities to apply these experiments for the author.

In the lights of these information, it can be clearly said that this research will be an Exploratory Case Study. In The Case Study Cookbook, one of the purposes of the Exploratory Case Study is explained as "Exploratory Case Studies may be used to justify and design a large-scale investigation by aiding in the design of research goals and questions in an inexpensive way." (Hayes *et al.*, 2015). Because of the fact that this research is a small sized research with restricted amount of people and area, this research can be a guidance to the larger scale studies. Additionally, a description in the Colorado States University website states that "Their basic function is to help identify questions and select types of measurement prior to the main investigation." (Bronwyn *et al.*, 1994). This small sized research will be guidance to an experiment which would be more meaningful and affective with the questions asked and will be asked after the research will be done.

3.2.2 Data Collection

The methods which will be used in this research is collecting primary data by applying open-ended questionnaire and survey to the participants. The main aim of this research is collecting both quantitative data and qualitative data to make the data proper to analyze with statistic. Also, if more data can be collected, the result of the data will be objective rather than subjective. The objectiveness of the data will be decided according to the meaningfulness level of the resulting statistics.

Firstly, because of the recent pandemic crisis, data will be collected online. At the beginning, the author planned to apply the questionnaires and surveys face-to-face to gain more participants. However, because of the pandemic crisis, these data collecting methods should be applied through internet environment. This will provide the researcher with

reaching more people. However, even though the proper response rate of a survey or questionnaire to have a meaningful and acceptable results is 60%, online surveys and questionnaires have only 25%-30% response rate (Fincham, 2008). The low response rate will cause decrease in the number of participants.

Additionally, according to an article in Journal of Computer – Mediated Communication, longs surveys decrease the rate of participants and response (Sheehan, 2001). Therefore, the questionnaire and surveys will not be long to increase the response rate.

Also, design of the online surveys is important for the increase in the response rate. In this issue, related articles will be used to design an effective online survey to increase the response rate.

In addition to primary data collection, the researcher will collect secondary data to examine the neurological and biological causation and correlation of the effects of physical working environment and working time patterns on the performance of the software developers in Turkey. The reason behind collecting secondary data is inability to implement scientific experiments on participants. Therefore, peer-reviewed secondary data will be collected to scientifically support the research.

3.2.3 Nature of Data

As stated above, the nature of the data will consist of both qualitative and quantitative features and the data will be collected through open-ended questionnaire and surveys which will be distributed online. The nature of the data will consist of both qualitative and quantitative features. Therefore, the received data will be answers to the questions in the distributed survey and questionnaire. The structure of the data will include both sentences or words which are personally written by participants as answers to the open-ended questions in the questionnaire and as choices among the numerical scales or scale of close-ended answers.

The open-ended questionnaire questions will be used to collect the data which cannot be restricted or made close-ended easily. For example;

- Why is your performance at night higher, equal or lower?
- Why is your performance on weekends higher, equal or lower?

These type of questions, which are open-ended, require numerous choices to restrict. Therefore, there will be questionnaire which can be answered from participant independent from restricted choices. The answers which are given from the participants will be used in statistics and it will provide the researcher with new point of views.

In addition to the open-ended questionnaire, there will be close-ended multiple choice survey to analyze the opinions of the participants. As an answer to these questions, participant will choose one of the given multiple choices. The data which will be collected from this method of data collection will be used create statistics and the choices will be given after a detailed research by the researcher.

As an example to the questions which will be used in survey;

- Which period of the day your performance becomes higher?
    - Morning
    - Afternoon
    - Evening
    - Night
- Considering your performance, would you rather complete your weekly work hour in a flexible way? (i.e. Let's assume that your weekly working hour is 40 hours, which means you can choose to complete it by working 20 hours two days or 10 hours four days or 8 hours 5 days, etc.)
    - Yes
    - No

With the help of the open-ended questionnaire the data will be broader and open to exceptions and with the help of the close-ended survey, the data will be more prone to analyze and statistics.

3.2.4 Ethics

In this research, survey and open-ended questionnaire will be applied to the participant. The survey and questionnaire will be applied online. During the collection of the data the ethics rules will be applied and followed. The ethics rules which should be followed are listed below;

- Confidentiality: The data which are gathered from the participant will be confidential and the importance will be given to the confidentiality of the participant. Additionally, information gathered from the participant will be confidential and secure. All the participant will be anonymous (Kelley *et al.*, 2003).
- Ensuring Understanding: It will be ensured that the participant fully understand the aim of the data collection and fully understand the questions that will be asked. Additionally, participant will be answered if there are questions that he/she want to ask and they will be informed anytime they request information (Kelley *et al.*, 2003).
- Children exclusion: People under 18 years old will not be participated in the research (Kelley *et al.*, 2003).
- Adults with special conditions exclusion: Adults with special conditions which not allow them to decide healthily such as substance abuse, schizophrenia, depression, mental retardation or dementia will be excluded from the research (Kelley *et al.*, 2003).
- Right to withdraw: Participants will have a right to withdraw from the questionnaires and surveys any time they want. Also, they will have a right to withdraw any information they gave or are giving (Kelley *et al.*, 2003).
- Copyright: The data which are gathered from the participants will not be displayed in public platforms if participant doesn't allow the researcher. All the copyrights will be given to the participant who share their data with the researcher (Kelley *et al.*, 2003).
- Harm avoidance: There will not be any kind of question which have a probability to cause any type of harm (including mental harm) to the participant (Kelley *et al.*, 2003).

Therefore, these ethical rules will be applied before, during and after the data collection and development period of this research.

3.2.5 Analysis Techniques

In this research, the data will be collected from the help of the surveys and questionnaires which will be applied to as much participants as can be. Therefore, as mentioned before, the data will be consisting of the choices of multiple choice questions in the surveys and writing answers to the open-ended questionnaire questions. Thus, the data which will be collected will include the features of quantitative and qualitative data.

The statistics analysis will be applied to the quantitative data with the help of code book which provides the researcher with ordered and grouped data analysis. These coding will be performed by dividing and grouping the answers according to their relationships between each other.

As mentioned on the website of California State University "Analysis begins with the labeling of data as to its source, how it was collected, the information it contains, etc." (California State University, 2020). Therefore, the data gathered which as text from open-ended questionnaires and choices from the multiple choice surveys, will be firstly distributed according to their method of collection such as survey and questionnaire. Secondly, data which is distributed according to their collection method will be distributed and grouped again according to the information they contain. Secondary, distribution will be performed into the groups which is created in the first step of grouping. There will be subgroups in each group until further group cannot be created.

At the end of data grouping, analyzing, decoding and interpretation of the data will be easier and more meaningful for both researcher and the readers.

1. ANALYSIS OF THE FINDINGS

In this chapter the findings of this research survey which is collected from 84 software developers in Turkey will be analyzed and discussed.

Firstly, the results of the research survey related to the elements of the working time patterns on the software developers in Turkey will be analyzed. Data collected to examine the effects of flexible working hours, duration of working hours and working at weekends and nighttime will be analyzed and discussed under the working time patterns title.

Secondly, the outcomes of the research survey related to the effects of the elements of the physical office environment will be analyzed and discussed. Under the physical office environment heading, the data collected from the survey about the office structures, ergonomics and color of the office will be analyzed and discussed.

4.1. WORK TIME PATTERNS

4.1.1 Flexibility of Working Hours

To analyze the relationship between flexible working hours and work performance in the software developers in Turkey, survey answers will be analyzed and interpreted.

According to the survey which includes both qualitative and quantitative data, 84 participants answered the survey questions regarding their performance level if they had or have flexible work schedule opportunity. Even though a small percentage of the software developers in Turkey don't want to complete their weekly work hours in flexible way, the majority of the participants think that working in flexible work hour schedule would increase their performance.

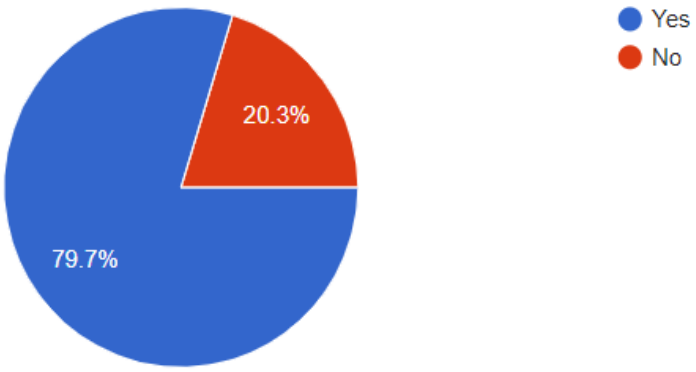

Figure 6. Pie Chart of the answers to the question Considering your performance, would you rather complete your weekly work hour in a flexible way? (i.e. Let's assume that your weekly working hour is 40 hours, which means you can choose to complete it by working 20 hours two days or 10 hours four days or 8 hours 5 days, etc.).

As shown in the pie chart above the participants of the survey who are software developers in Turkey and currently working de facto, states that they would rather complete their weekly working hours in a flexible way. Approximately, %80 of the participants answered the question "Considering your performance, would you rather complete your weekly work hour in a flexible way?" as Yes. Additionally, approximately %80 of the participants answered the question "Do you think completing weekly work hours in a flexible way would made you perform better at work?" as Yes which means the software developers who currently work in Turkey thinks that working in flexible working schedule increase their performance level in their work. Thus, what is the reason behind the case that Software developers in Turkey want to spend their weekly wok hours in flexible way or not and why do they think that working in flexible weekly work schedule increase their performance or not?

Firstly, considering the answers of the participants who would rather to complete their weekly working hours in a flexible way, there are several reasons behind that working in flexible working schedule increase their performance at work.

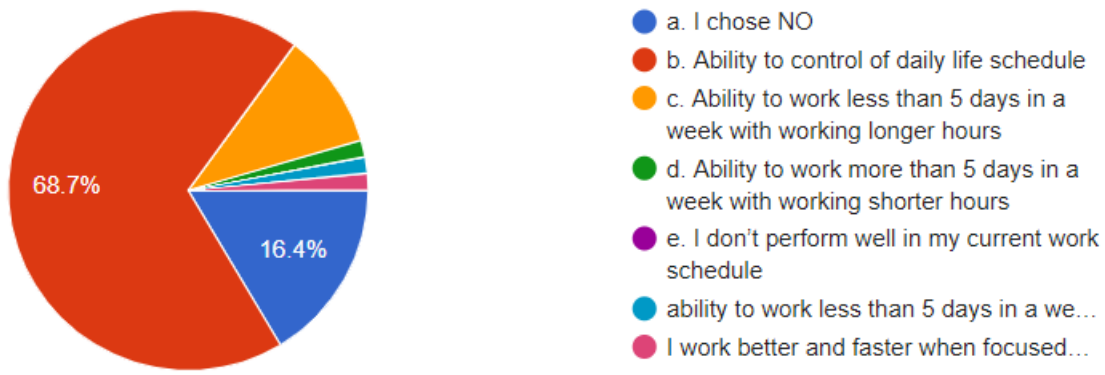

Figure 7. Pie Chart of the answers to the question "IF YES, why do you think flexible working hours would increase your performance?"

As seen in the pie chart of the answers given to the question "IF YES (yes, flexible working hours would increase my performance), why do you think flexible working hours would increase your performance?", %68.7 of the software developers in Turkey think that ability to control their daily life schedule would increase their performance in their work.

This situation allows them to perform better at work by providing them with arranging their own daily schedule, with more control and autonomy on their life and better work-life balance. Consistent with articles which are studied by International Labor Office (2012), Goudswaard et al. (2012) and Altındağ and Siller (2014) (see chapter 2.1.1), arranging their own schedule considering their daily needs and responsibilities except their work would increase their performance and productivity at work according to the answers of the participants of this research survey due to the increased work-life balance.

Another %10 of the participants would rather flexible working hours because they stated that they would rather work less than 5 days in a week with working longer hours in their work days. This option is against the legal definition of the flexible working hours which stated as 'working determined core hours in 5 days of the week and flexible schedule except core hours', however, this definition covers every employee not specifically software developers. Thus, considering the working conditions and patterns of the software developers, core hours may have been necessary however %10 of the participants chose that option which can be interpreted as that proportion of the Software developers in Turkey does not need the core hours in work week or need more spare time than 2 days a week even if they work longer hours in their work days.

The remaining proposition of the participants stated that they want to work more than 5 days in a week with less daily working hours (%1.5 of the participants) and approximately

% 20 of the participants stated that they wouldn't want to work in flexible working schedule.

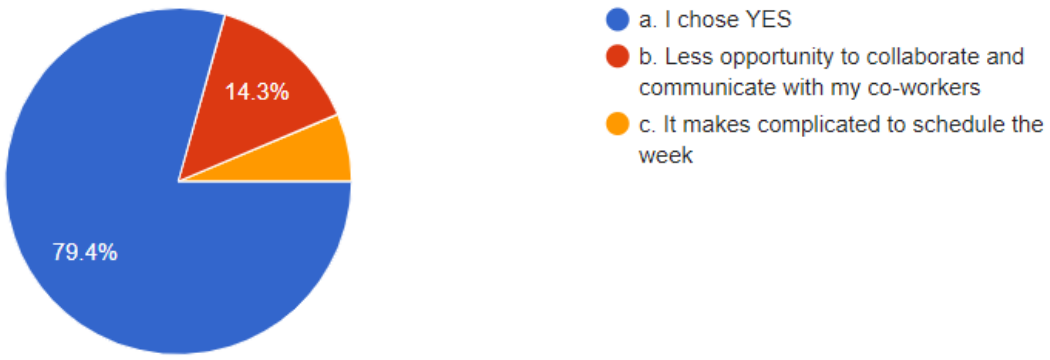

Figure 8. Pie Chart of the answers to the question "IF NO, why do you think flexible working hours would decrease your performance?"

As pie chart in in the Figure 8 shows, consistent with the articles written by Owen (1977), as the reasons behind their unwillingness to work in a flexible work schedule, %14.3 of the participants stated that less opportunity to collaborate with their co-workers and %6.3 of the participants stated that scheduling the work week in a flexible way is complicated.

Thus, to increase the work-life balance, ability to control their schedule, including their work and personal life schedules, and their autonomy level, flexible working hours would be a performance maximizing option for the software developers in Turkey.

4.1.2 Duration of Working Hours

To analyze the relationship between duration of weekly or daily working hours and work performance in the software developers in Turkey, survey answers will be analyzed and interpreted in this section.

According to the data collected from 84 Participants who are software developers in Turkey, it is found that more than %95 of the participants works more than or equal to 40 hours in a week. Majority of the participants, more than %88, also reported that they work more than or equal to 45 hours in a week. In addition to this, approximately %66 of the participants stated that they usually work more than or equal to 50 hours a week.

However, when it comes to asking the participants whether amount of their weekly work hour is too much, the responses are surprising and not consistent with the literature.

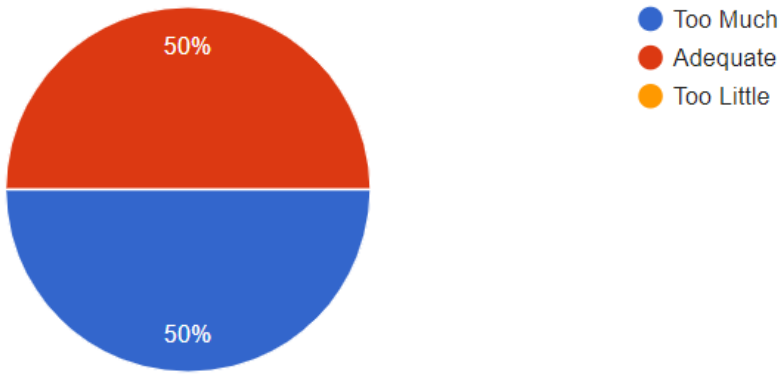

Figure 9. Pie Chart of the answers to the question "Considering your performance related with weekly working hours, do you think your weekly working hour is…".

Even though %50 of the participants stated that their weekly working hour amount is too much considering their performance, the remaining half of the participants think that their weekly working hour amount is adequate. The half of the participants who think that their weekly working hour amount is adequate mostly consist of software developers who work 40 hours or less in a week. However, approximately %15 of the participant who work more than or equal to 45 hours think that their weekly working hour amount is adequate considering their performance at work.

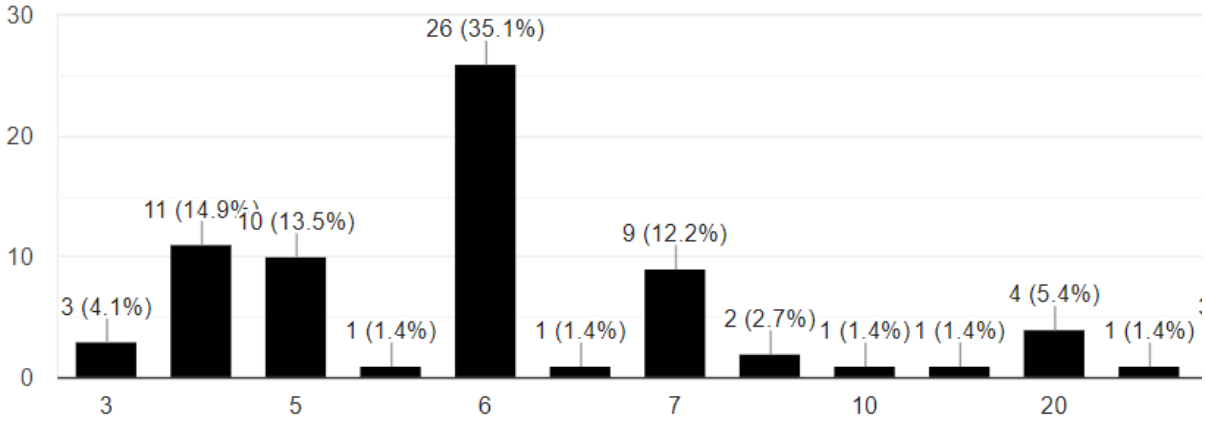

Figure 10. Bar Chart of the answers to the question "How many hours do you perform effectively in a work day?"

When it comes to the amount of hours that software developers in Turkey perform effectively in a work day, the majority of the participants stated that they the amount is 6 or less hours. As seen in the Figure 10 above, approximately %69 of the participants stated that they perform effectively less than or equal to 6 hours in a work day which is consistent with the article written by Glaveski (2018). The remaining part of the participants stated that they can work effectively more than 6 hours a day. Approximately, %17 of the participants stated that they can work effectively between 7-10 hours in a work day. Surprisingly, %8.2 of the participants stated that they can work effectively more than 10 hours in a day.

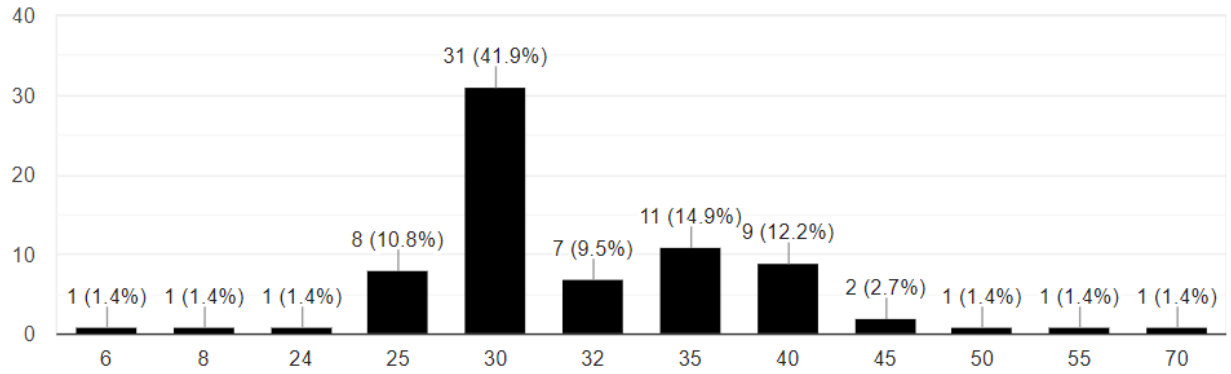

Figure 11. Bar Chart of the answers to the question "Considering your performance related with weekly working hours, how many hours do you think weekly work hour should be?"

When the participants asked to answer the question that how many hours should a weekly working hours be considering their performance, the answers are distributed as shown in the Figure 11. More than half of the participants, which is %54,1, thinks that weekly working hours should be less than or equal to 30 hours and %41,9 of the participants think that weekly working hours should be exactly 30 hours. On the other hand, %39,3 of the participants think that weekly working hour amount should be between 32-45 hours. A very minor part of the participants, which is %4,2 thinks that weekly working hours should be more than 50 hours up to 70 hours considering their performance at work.

Thus, in the light of this research survey, it can be concluded that weekly from 30 up to 40 hours for the software developers in Turkey would be the best option to maximize their performance level in their work.

4.1.3 Working at Weekend and Nighttime

4.1.3.1 Weekend

To analyze the relationship between working at weekends and work performance in the software developers in Turkey, survey answers will be analyzed and interpreted in this section.

According to the survey it is found that %93,2 of the participants have worked on the weekends throughout their work life. Another %5,4 of the participants has never worked on weekends and %1,4 of the participants stated that they rarely work on weekends.

When participants asked about their performance while they are working at weekends compared to weekdays, %56,8 of the participants stated that their performance is lower, %23 of the participants stated that their performance is equal with the weekdays and %20,3 of the participants stated that their performance is higher in weekends compared to weekdays.

The participants who perform worse at the weekends stated that they want to spend their weekends with their family and friends and this situation is consistent with the article written by Wirtz et al. (2011) and Bryson and Forth (2007) (see chapter 2.1.3.1). Additionally, they stated that there is a need for themselves without thinking about the work. However, the participants who stated that their performance level is equal compared to the weekdays stated that there is less people in the office at the weekends which provides them with more concentration.

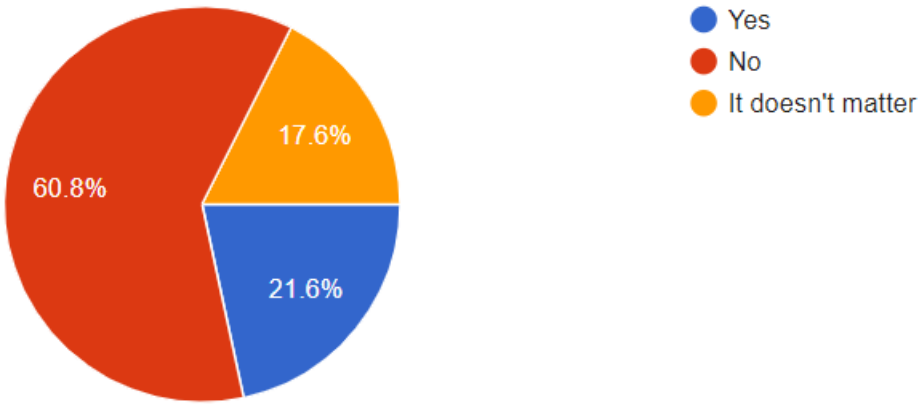

Figure 12. Pie Chart of the answers to the question "Considering that you can complete your weekly work hours flexibly, would you prefer to complete a part or all of your weekly work hours on weekends?"

Consistently, when it is asked to the participants that whether they want to complete their flexible working hours using their weekend, %60,8 of the participants stated that they don't prefer this case. However, approximately %22 of the participants stated that they want to complete their weekly flexible working hours using their weekends and lastly %17,6 of the participants stated that it is not important to use their weekends or not.

When the participants asked about the reason behind their answer, participants who do not prefer to work at weekends stated that they need spare time to spend with their loved ones, to themselves and to relax without thinking about their work. Additionally, they stated that when their loved ones are having their spare time, being at office decreases their performance. Thus, majority of the participants do not prefer to work at weekends because it decreases their work-life balance. On the other hand, participants who would prefer to use their weekends to complete their weekly work hours stated that it becomes easier to schedule the entire week if they can use the weekends.

Thus, in the light of this research survey, it can be concluded that working at weekends to complete their flexible weekly working hours is not a good option to increase the performance of the software developers in Turkey.

4.1.3.2 Nighttime

To analyze the relationship between working at nighttime and work performance in the software developers in Turkey, survey answers will be analyzed and interpreted.

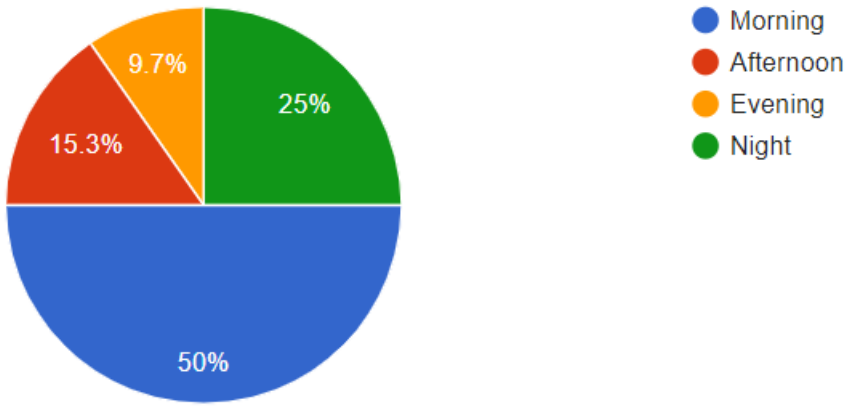

Figure 13. Pie Chart of the answers to the question "Which period in a day does your performance become higher?"

Participants of this research survey are asked to choose which period of the day they perform better and as Figure 13 shows, %50 of the participants stated that they perform better in the morning, % 25 of the participants stated that they perform better in the night time which is highly consistent with the article written by Bahammam et al. (2011) (see chapter 2.1.3.2). The remaining part of the participants which is %15,3 stated that their performance becomes higher at afternoon and %9,7 stated that evening is the period of the day which they perform better.

Additionally, participants of the research survey are asked to compare their performance in the day time and in the night time. According to the results, %51,4 of the participants stated that their performance is lower in the night time compared to day time. However, on the other hand, %40,3 of the participants stated that their performance is higher

in the night time compared to their performance in the day time and %8,3 of the participants stated that their performance is equal either in the daytime and the nighttime.

When the reasons behind their answer are asked to the participants who mentioned that their performance is higher in nighttime compared to the other periods of the day, they state that working at nighttime makes it easier to concentrate because of the less distraction factor and less stimuli. On the other hand, the participants who stated that their performance level is lower in the nighttime stated that they are sleepy and tired at the nighttime which is most probably because of their Circadian Rhythm due to the article which is written by Price (2011). (see chapter 2.1.3.2)

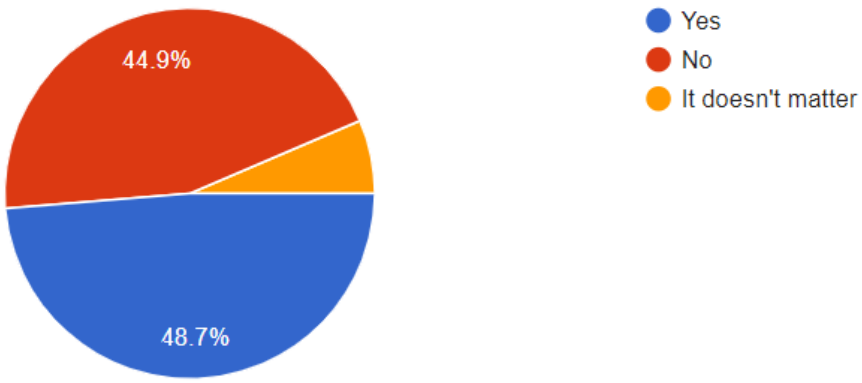

Figure 14. Pie Chart of the answers to the question "Considering that you can complete your weekly work hours flexibly, would you prefer to complete a part or all of your weekly work hours at night time?"

When the participants of the research survey are asked to answer the question whether they would prefer to complete their flexible working hours using their night time, surprisingly %48,7 of the participants stated that they would prefer to complete their weekly working hours by working at night time. Additionally, %6,4 of the participants stated that it is not important if they complete their weekly working hours using their night time. However, %44,9 of the participants stated that they would not prefer to work at nigh time and complete their weekly working hours using their night time.

The participants who stated that they would prefer complete their weekly working hours in the morning stated that they feel tired in the night time due to the effort spent in the

daytime. Additionally, they stated that their daily cycle, which is their Circadian rhythm, is not suitable for working at the nighttime. Consistent with the articles which are written by Kazemi et al. (2006), Chelappa et al. (2019) and Price (2011) (see chapter 2.1.3.2)), average person's daily rhythm, named as Circadian Rhythm, is not suitable for working at nighttime and it is also unhealthy to work at nighttime. In addition to the unsuitable structure of the human Circadian Rhythm to work at nighttime, working at night also causes several health problems due to the hormonal cycle and the sleep problems and this situation causes performance decrease in the employees.

However, on the other hand, %48,7 of the participants of the survey who are the software developers in Turkey stated that they prefer to complete their weekly working hours using their nighttime and there are several reasons behind their decision. Firstly, more than %40 of the participants who would prefer to complete their weekly working hours using nighttime stated that this situation can increase their work-life balance because they can do their daily work except their job in the mornings or they may have more free time in the remaining work days if they use their both daytime and nighttime in a couple of days of the week. In addition to the work life balance, %32 of the participants who prefer to use their nighttime stated that working at night is more easy to concentrate because of the less stimuli compared to the daytime. Also, there are several participants who perform well at the nighttime due to their personal body cycle.

Thus, in the light of this research survey, employers may provide a freedom of choice opportunity to work at nighttime to their employees who are Software developers in Turkey to complete their weekly working hours. Providing freedom of the choice opportunity to the employees with using their nighttime to complete their weekly flexible working hours can increase the performance level of the employees by increasing their work-life balance and it is also more suitable for %25 of the software developers in Turkey who perform better at nighttime by nature.

4.2 PHYSICAL WORKPLACE ENVIRONMENT

4.2.1 Office Structure

According to the literature review, there is a relationship between office structure and employee performance level. To determine the office structure preferences of the software developers in Tukey, participants of this research survey is asked to declare their office structure considering their performance level. The respondents distributed almost equally to open office structure and private room. However, there are several other alternatives except open office and private rooms that participants of the survey suggested. The Figure 9 below demonstrates the several office structure options in which Software developers in Turkey perform better who participated in this research survey suggested.

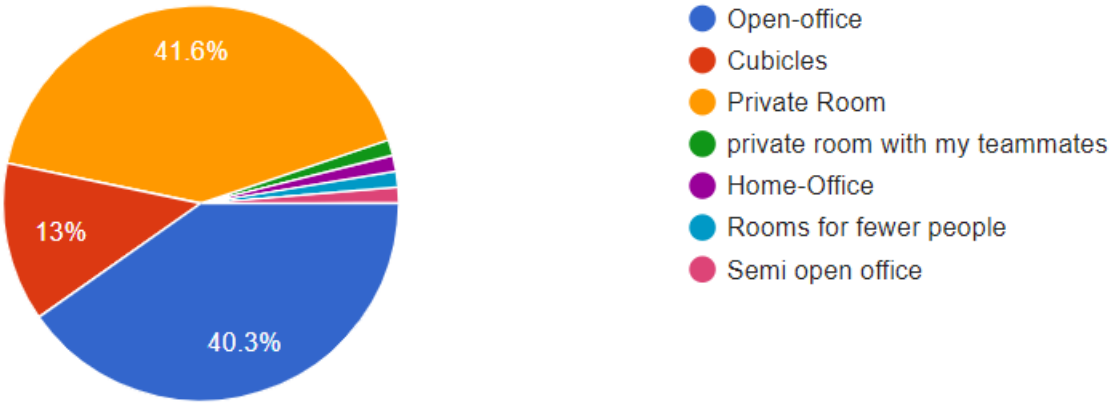

Figure 15. Pie Chart of the answers to the question "Which office structure do perform better?"

Except open office and private room office structures, some of the participants mentioned that they perform better in private room with team mates, rooms with fewer peoples, cubicles, semi open office and home-office. Cubicles option have the largest proportion of the participant preference after private room and open office. All the other office structure suggestions, which are private room with team mates, home office, rooms with fewer people and semi open office have same proportion of the participant preference with the value of %1,3.

Additionally, as Figure 15 shows, % 41,6 of the participants stated that they perform better in the private rooms, %40,3 of the participants stated that they perform better in the open office structure and the participant preference distribution between open office and private rooms is almost equal. There are several reasons behind the participants' preference of the open office and private room.

4.2.1.1 Open Office

One of the two largest proportion of the participants, which is %40,3 of the participants, chose the open office structure as the office structure which they perform better. To understand the participants' reasons of choosing open office structure as the office structure which they perform better, the open ended questions which asks the participants the cause of their choice should be analyzed.

When the participants who chose open office as the performance increasing office structure, are asked about the reason behind their answer. According to the answers, it is found that %70 of the participants, who chose open office structure, stated that opportunity to communicate easily with the colleagues is the reason behind their answer and this situation is consistent with the article which is written by Johnson et al. (2019) and Jensen et al. (2008). Also, %16,7 of the participants who chose open office stated that open office structure is more spacious than other types of office structure and this is the reason behind their choice. Lastly, %6 of the participants who chose open offices thinks that focusing on their work is easier in the open office structure.

4.2.1.2 Private Room

The other one of the two largest percentage is private room. It is found that %41,6 of the participants of this research survey chose the office structure which they perform better as private room. To examine the reasons behind the participants' choice of office structure as private room which they perform better, the open ended questions, which asked participants about the reason behind their choice, should be analyzed.

When participants, who chose private room as the office structure that they perform better, are asked about the reason behind their choice. The survey results show that %80,6 of

the participants who prefer private rooms to perform better stated that silence and higher concentration opportunity is the reason behind their choice and this result is consistent with the articled written by Haynes et al. (2017), Storey et al. (2019) and Cone and Gregory (2006) (see chapter 2.2.1.1). Also, as consistent with the article written by Haynes et al. (2017) (see chapter 2.2.1.1), %22,5 of the participants who chose private room stated that privacy is important for them and opportunity of privacy is the reason behind their answer. Additionally, % 6 of the participants stated that they chose private room because it is more spacious and there is more place for them to work and another %6 of the participants stated that private room eases the communication between the colleagues.

4.2.1.3 Other Office Structures

According to survey results, more than %20 of the participants stated that they prefer other types of office structures which they prefer to perform better. The highest percentage of the participants, who would not prefer open office or private room, chose cubicles office structure with the amount of %15,6. As consistent with the article written by Clayton (2012) (see chapter 2.2.1.1), when the reason behind their choice is asked to the participants, they stated that cubicles can provide them with both privacy and opportunity to communicate easily with colleagues at the same time. Thus, by providing privacy and communication opportunity at the same time, they think that cubicles can increase their performance level in their work.

The remaining %5,2 of the participants stated that they would prefer a private room which they share with their team mates. Same as the cubicles, participants who prefer private room to share and work with teammates stated that these rooms can provide them with more privacy, communication with teammates and silent environment compares to open office which can be distracting. Thus, with privacy, communication and less distracting noise, participants who chose private room with teammates think that this type of office structure can increase their performance at work.

In the light of this research survey, there is almost a par between open office structure and private room. Thus, the employers should provide an office with open office area and private rooms to their employees. Employees who perform better at private offices can use

the private offices and the other employees can use the open office or bigger private rooms for teamwork. By this implementation, the performance level of the software developers in Turkey most probably become higher considering the results of this research survey.

4.2.3 Ergonomics

As supported by the literature, ergonomics is another important physical office structure element which affects the employees' performance level at work. As a job branch which requires long hours of sitting in the computer workstation, software developers in Turkey are asked about that whether the ergonomics of their computer workstation affect their performance level. As consistent with the article written by Ravindran (2019) (see chapter 2.2.3), this research survey found that %98,7 of the Software developers in Turkey think that ergonomics of their computer workstation is important element which affects their performance level on their job. According to survey, %83,1 of the participants stated that ergonomic computer workstation increases their performance level and %15,6 of the participants stated that computer workstation which is not fully equipped decrease their performance level at work. Thus, it is clearly concluded that there should be ergonomic tools in the computer workstation, as much as employers can afford, to increase the employees' performance level while working.

When participants asked about which ergonomic equipment they have in the workstation, %84,4 of the participants are provided with adjustable and comfortable ergonomic chair, % 71,4 of the participants are provided with a comfortable desk with enough working space, %5,6 of the participants have a tool to comfort their wrist, hand and arm while using keyboard and mouse. Participants also asked about if there is another tool which increase their performance with providing them with better ergonomic work place. According the responses of the survey, %16,8 of the participants stated that they need better computer monitor options such as multiple monitors, monitors with larger screen and better resolution, adjustable monitor and device for the monitors which prevents eyestrain. In addition to the monitors, participants offered several equipment to increase their performance level by increasing ergonomics level such as better air conditioning, leg support, extra keyboards for laptops, larger mousepads and adjustable desk. Also, approximately %7 of the

participants stated that they need recreational areas such as resting place, cafeteria or food station and sports area for stretching.

In the light of the survey results, it is concluded that for the software developers in Turkey, there should be an ergonomic computer workstation to increase their performance level. Additionally, uncomfortable computer workstation causes a decrease in performance level of the Software developers in Turkey. Thus, a computer workstation should include ergonomic chair which is adjustable and comfortable, there should be a large desk with enough workspace, keyboard and mouse usage should be ergonomic and shouldn't cause any pain in user's hand, wrist and arm. Additionally, there should be large mousepad and multiple monitors with high resolution and large screen. If the employer can't afford multiple monitor, the existing monitors should be large and have high resolution. There may be tools for supporting the legs. Lastly, except computer workstations, several participants mentioned that there is lack of air conditioning in their office environment. Thus, additively, employers should provide a good air conditioning in their office.

4.2.4 Dominant Color of the Office

According to the research survey, as Figure 16 shows, %42,6 of the participants stated that their office's dominant color is white, %16 of the participants' office is gray, %14,6 of the participants' office is green, %13,3 of the participants' is blue, %5,3 of the participants' is red and %8 of the participants' office is other colors such as beige, yellow and brown.

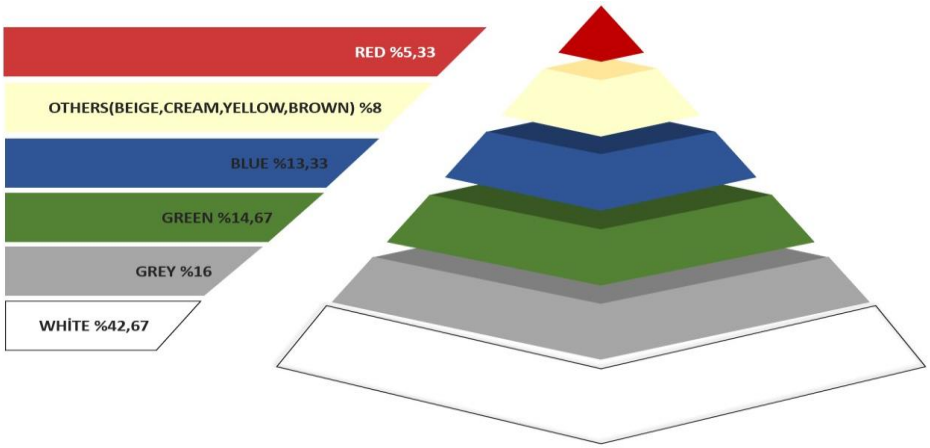

Figure 16. Pyramid Chart of the answers to the question "What is the dominant color in your office?"

Considering their dominant color in their offices, participants are asked about whether the dominant color of their office have an effect on their performance.

Figure 17. Pie Chart of the answers to the question "Does the dominant color in your office affect your performance while working?"

As Figure 17 shows, the research survey found that %51,9 of the participants stated that the dominant color in their office does not have any effect on their performance. However, %39,2 of the participants stated that the color of their office affect their performance and the remaining %9 of the participants could not decide whether their office color effect their performance or not.

Additionally, participants of the survey are asked about if their dominant office color increase or decrease their performance at work.

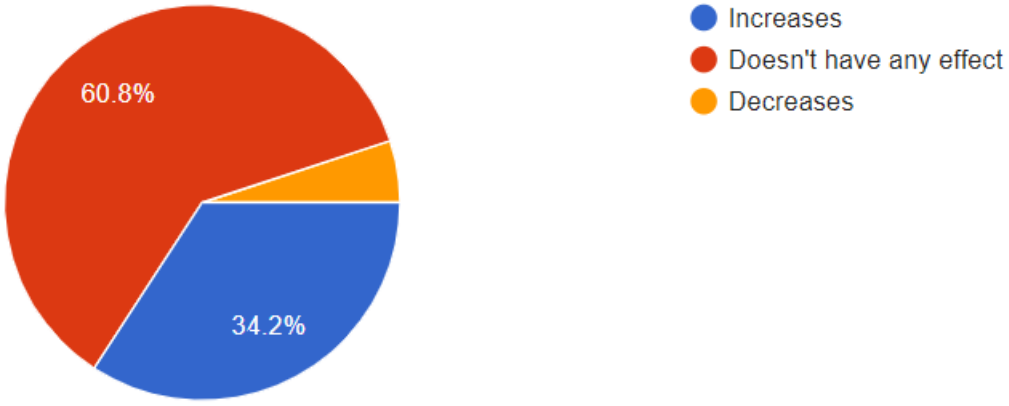

Figure 18. Pie Chart of the answers to the question "How does the dominant color in your office affect your performance while working?"

As Figure 18 demonstrates, inconsistent with the articles written by Ozturk (2010) andDzulkifli and Mustafar (2013) (see chapter 2.2.4), %60,8 of the participants indicated that the dominant color of their office have no effect on their performance. However, the remaining % 34,2 stated that the color of their office increases their performance while the other % 5 indicated that the color of their office decreases their performance while working.

Also, it is found that %37 of the participants, who remarked that dominant color of their office environment increases their performance, stated that their dominant office color is white. When the participants were asked about the reason why white increases their performance, they indicated that white is bright, calm, makes the office feel more spacious and increases their mood. On the other hand, participants who indicated that their office is white and it is decreasing their performance because white is depressing. However, this statement is rather rare and personal.

Besides, %22 of the participants stated that the dominant color of their office is gray and it increases their performance. The participants also indicated the reason why gray increases their performance as that gray increases their focus and it is a calm color. On the other hand, there are very small percentage of participants who think that gray is depressing and decreasing their performance. However, this declaration is rather rare and personal.

In addition, %18,5 of the participants stated that the dominant color in their office is blue and it increases their performance because blue is a calm color. There are several other dominant colors of the participants' offices such as green and cream which increases their performance. However, the percentage of these colors as quite low as can be ignored.

As inconsistent with the article written by Elliot et al. (2007) (see chapter 2.2.4), one participant stated that the dominant color of his/her office is red and it increases his/her performance because red makes his/her aggressive and increases the speed of his/her performance. However, this data cannot be considered because of the rareness and it is quite exceptional.

Consistent with the article which is written by Augustin (2015) (see chapter 2.2.4), when participants asked if there is any dominant color for their which they think it increases their performance, approximately %40 of the participants who stated that the dominant color of their office have an effect on their performance shared their preferences. According to the research survey, %35 of the participants who thinks that color of their office affects their performance indicated that they prefer white as their office color because they indicated that white increases their focus and it is bright and increases their mood.

Also consistent with the article written by Ozturk (2010) (see chapter 2.2.4), the other %22 of the %40 of the participants of this research who stated that the dominant color affect their performance declared that they prefer nude colors as their office color such as gray and cream because these colors are calm so these colors increase their performance. Also, %19 of that %40 percent, stated that blue office can increase their performance because it is calm and increases their mood. However, these data are quite rare and exceptional to take into consideration and deduce a conclusion.

As a conclusion, the dominant color of the office environment does not any effect on the majority of the participants. However, participants who stated that dominant color of their office environment have an effect on their performance have a considerable amount and the majority of these participants chose white and nude colors such as gray and cream as their performance increasing office colors. Thus, considering the results of this research survey, we can conclude that white and nude colors such as gray and cream should be the

dominant colors of Software developers in Turkey' office environment to increase and maintain their performance level.

5. CONCLUSION

This research aims to create a physical office environment and working hours' patterns for the software developers in Turkey to increase their performance level in their work. Turkey is one of the countries which has an increasing software sector, therefore analyzing the factors may affect the performances of software developer in Turkey and finding solutions to increase their performance level eventually contribute to the software sector in Turkey.

In this research, it is found that the important elements of the physical office environment are office structure types such as open office, private rooms, and semi open office types, the dominant color of the office and the ergonomics of the computer workstation. In addition to that, it is found that work hour patterns are flexible working hours, duration of the weekly or daily work time, working at exceptional periods such as nighttime and weekends.

After detailed literature review and the research survey which includes qualitative and quantitative features, conclusions are drawn in terms of optimal physical office environment and working hour patterns which increase the performance level of the software developers in Turkey.

Firstly, in the light of the literature review and research survey results, it is found that flexible working hours can increase the performance level of the software developers in Turkey due to the increased work-life balance and autonomy level of the participants. By the help of the flexible working hours, software developers in Turkey may arrange their weekly schedule according to their personal life preferences and responsibilities and this situation can increase their performance level at work.

Secondly, this research found that the optimal weekly working hours for the software developers in Turkey should be minimum 30 hours to maximum 40 hours. Additionally, majority of the participants stated that they can work with a high performance approximately

6 hours a day. Thus, considering their breaks during work, 30 to 40 hours weekly can be optimal duration of work hours which can increase their performance. By this option, participants fatigue decreases and the work-life balance increases.

Thirdly, it is found that working at weekends, to complete their flexible weekly working hours, is not a good option to increase the performance level of the software developers in Turkey due to the decreased work-life balance. It is concluded that participants need spare time to spend with their family and friends, to spend themselves and to relax. Thus, working at weekends to complete their flexible working hours most probably decrease software developers in Turkey' performance level at work.

On the other hand, it is found that participants are willing to use their nighttime to complete their weekly flexible working hours. Participants of this research survey declared that working at nighttime can increase their work-life balance. Additionally, there are considerable amount of participants who are naturally perform better at nighttime. Thus, providing an option for the software developers in Turkey to complete their flexible weekly working hours using their nighttime most probably increase their performance level.

When it comes to office structure, it is found that participants prefer open office and private rooms equally. The participants who prefer open offices stated that opportunity to communicate with colleagues is the reason behind their increased performance level. On the other hand, participants who prefer private rooms stated that privacy and concentration opportunity in private rooms increase their performance level. Small but considerable proportion of the participants also indicated that cubicles and private rooms for the team members are the best option for increased performance level because cubicles provide them with both privacy and easy communication with their colleagues and private room for teams provide them with better concentration opportunity while easily communicating with colleagues. Thus, it is concluded that an office should include each type of office structure. According to results of this research, an office with the opportunity of both open office area, private rooms for individuals, private room for teams and cubicles area for the employees to work in according to their preferences increase the performance of the software developers in Turkey.

In addition, according to the results of this research, it is found that ergonomics of the computer workstation is rather important factor which affects the participants' performance level. Participants stated that lack of ergonomics in their computer workstation cause performance decrease in their work. It is found that participants need an ergonomic chair which is adjustable and comfortable, a desk with enough work space, high resolution monitors which are more than one or one with large screen and ergonomic tool for keyboard and mouse usage and also leg support. Except computer workstation, participants stated that good air conditioning is very important for their performance.

When it comes to color, it is found that dominant color of the office environments of the software developers in Turkey is not very important for their performance level. However, considerable amount of participants, who stated that the dominant color of the office environment affects their performance, declared that white is the best option to increase their performance because it is bright and it increases the participants' mood. Additionally, nude colors such as cream and gray can be preferred because participants thinks that they are calm color which can increase their performance level.

In conclusion, this research determines the performance increasing elements of the physical office environment and working hour patterns for software developers in Turkey. To create a physical office environment and working hour patterns to maximize the performance level of the software developers in Turkey, factors and elements are identified and the features and arrangements of these elements are found.

6. RECOMMENDATIONS

This research found that the physical office environment elements and working hour patterns have an effect on the performance level of the software developers in Turkey. Additionally, the arrangements and the features of the mentioned physical office environment elements and working hour patterns are identified and determined in this research to maximize the performance level of the mentioned employee population. To increase the performance level of the software developers in Turkey, this research can be used as a guide for the employers.

Considering the results of this research, the employers should provide the employees with flexible working hours with the opportunity of using nighttime. The weekly working hours should be minimum 30 hours to maximum 40 hours.

Additionally, employers are recommended to provide their employees the office structure which includes not only open office area and private rooms for one person but also cubicles and private rooms for teams. Also, the computer workstation of the employees should include ergonomic chair, ergonomic desk with enough work place, ergonomic tools for using keyboard and mouse, multiple monitors or a monitor with large screen and high resolution and ergonomic tool to support the legs. Except the computer workstation ergonomics, the air conditioning of the office should be in an ergonomic level. Lastly, the dominant color of the office should consist of white and nude colors.

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APPENDICES

APPENDIX A

Research Survey

PARTICIPANT CONSENT FORM

This research is being performed by Doga Zeynep Germen who is a student at Griffith College Dublin Masters of Science International Business Management.

Aim of This Study: The aim of this research is finding the most appropriate environment and work time pattern for the software developers in Turkey to maximize their performance and productivity.

Profile of Participants: People, without any discrimination and restriction, who work as software developer in Turkey can participate in this research.

Risks of Participating in This Research: Participants of this research survey may experience discomfort answering the questions due to their negative experiences about their work environment or work time pattern in their current or previous jobs.

Potential Benefits: The benefits of being participated in this research is helping to understand the performance maximizing elements of the work environment and work time patterns of the software developers in Turkey. Additionally, it may contribute to understand the performance and productivity adjuvants for the other IT employees.

Anonymity: Participants of this research survey will be kept entirely anonymous. No information will be taken or shared from the participants. Any information that you involuntarily provide such as your location will not be used and shared.

Voluntary Nature of The Research: This research is being conducted with only voluntary participants. You may reject taking this survey or participating in this survey. If you want to withdraw anytime while answering the questions, you are completely free to leave the survey. Additionally, if you don't want to answer one or more of these questions, you are completely free to not answer the questions you don't want to.

If you have any questions, do not hesitate to contact Doga Zeynep Germen.

E-Mail: dogazgermen@gmail.com

Phone Number: +905558613994

Considering Participant Consent Form, do you accept to participate in this survey?

a. Yes
b. No

1. **What is the dominant color in your office?**
   - (Open ended answer box)
2. **Does the dominant color in your office affect your performance while working?**
   a. -Yes
   b. -No
   c. -Other (open ended answer box)
3. **How does the dominant color in your office affect your performance while working?**
   a. Increases
   b. Doesn't have any effect
   c. Decreases

4. **IF YES TO QUESTION 2, why do you think that dominant color affects your performance (If NO, please type NO)?**
   - (Open ended answer box)
5. **IF YES TO QUESTION 2, which color would you prefer your office to be to improve your performance at work (If NO, please type NO)?**
   - (Open ended answer box)
6. **Considering your answer to Question 5, why did you choose that color?**
   - (Open ended answer box)
7. **Does the comfort and ergonomic of the computer workstation in your office affect your performance?**
   a. -Yes
   b. -No
   c. -Other (open ended answer box)
8. **IF YES, how does it affect your performance?**
   a. I chose NO.

b. Increases

c. Decreases

9. Which equipment would you want to have to improve your comfort and ergonomics which provide you better performance at work?

1)Adjustable and comfortable chair

2)A comfortable desk

3)Equipment which comforts you while using keyboard or mouse

a. All

b. 1-2

c. 1-3

d. 2-3

e. None

f. Other

10. Is there any other tool would you want to have to increase your performance with increasing your ergonomics level?

- (Open ended answer box)

11. Which office structure do you perform better?

a. -Open-office

b. -Cubicles

c. -Private Room

d. -Other (open ended answer box)

12. Why do you perform better in the office structure that you chose?

- (Open ended answer box)

13. How many hours do you work weekly?

- (Open ended answer box)

14. Considering your performance related with weekly working hours, do you think your weekly working hour is...

a. -Too Much

b. -Adequate

c. -Too Little

15. How many hours do you perform effectively in a work day?

- (Open ended answer box)

16. Considering your performance related with weekly working hours, how many hours do you think weekly work hour should be?

- (Open ended answer box)

17. Considering your performance, would you rather complete your weekly work hour in a flexible way? (i.e. Let's assume that your weekly working hour is 40 hours, which means you can choose to complete it by working 20 hours two days or 10 hours four days or 8 hours 5 days, etc.)

a. -Yes
b. -No

18. Do you think completing weekly work hours in a flexible way would make you perform better at work?

a. -Yes
b. -No

19. IF YES, why do you think flexible working hours would increase your performance?

a. I chose NO
b. Ability to control of daily life schedule
c. Ability to work less than 5 days in a week with working longer hours
d. Ability to work more than 5 days in a week with working shorter hours
e. I don't perform well in my current work schedule
f. Other (open ended answer box)

20. IF NO, why do you think flexible working hours decrease or doesn't change your performance at work?

a. I chose YES
b. Less opportunity to collaborate and communicate with my co-workers
c. It makes complicated to schedule the week
d. Other (open ended answer box)

21. Which period in a day your performance becomes higher?

a. -Morning
b. -Afternoon
c. -Evening
d. –Night

22. Is your performance higher or lower at night time compared to day time?

a. -Higher
b. -Equal
c. -Lower

23. Considering your answer to Question 22, why is your performance at night higher, equal or lower?

- (Open ended answer box)

24. Considering that you can complete your weekly work hours flexibly, would you prefer to complete a part or all of your weekly work hours at night time?

a. -Yes
b. -No
c. -It doesn't matter

25. Considering your answer to Question 24, what is the reason behind your answer?

- (Open ended answer box)

26. Have you ever worked on weekends?

a. -Yes
b. -No
c. -Other (open ended answer box)

27. IF YES, how is your performance on weekends compared to week days?

a. I chose NO
b. Higher
c. Equal
d. Lower

28. **Considering your answer to Question 27, why is your performance on weekends higher, equal or lower?**
    - (Open ended answer box)
29. **Considering that you can complete your weekly work hours flexibly, would you prefer to complete a part or all of your weekly work hours on weekends?**
    a. Yes
    b. No
    c. It doesn't matter
30. **Considering your answer to Question 29, what is the reason behind your answer?**
    - (Open ended answer box)

Survey Link

https://docs.google.com/forms/d/e/1FAIpQLSc5CM4_8HlxemXIQrqaZEhrlfoT8PM8ch2DWn96HVkFHEHaVw/viewform?usp=sf_link