WORKPLACE DESIGN AND ITS IMPACT ON EMPLOYEE PRODUCTIVITY IN SOFTWARE INDUSTRY

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DECLARATION

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ABSTRACT

In today's competitive business world, employee productivity is an essential element of the success of any company. Employee productivity can be affected both positively and negatively by the workplace design. Further, a poor workplace design contributes to the deterioration of employee morale, job satisfaction, health and wellbeing. However, it seems that workplace design is barely regarded as important and a strategy for the improvement of the employee productivity. This study attempts to assess the relationship between the workplace design and employee productivity in the software industry, and to identify the key factors of the workplace design that have a significant impact on the productivity of software professionals.

The target population of this study is the software professionals who work in large scale software companies with 100 or more employees, in Sri Lanka. The data for the study was obtained from an online survey and it was analyzed quantitatively using statistical methods and techniques.

The research identified a significant positive relationship between workplace design factors and the productivity of software professionals. The results confirmed that spatial factors, environmental workplace factors and recreation amenities have a significant impact on the employee productivity. Further, it appeared that the relationship between recreation amenities and the employee productivity is influenced by the organizational culture.

This research gives ample reasons for software organizations to consider the workplace design as an important factor in increasing the productivity of their employees, which is one of the most valuable assets of the organization. The research presents valuable suggestions and recommendations for employers on improving their workplace design and thereby enjoying direct and indirect benefits associated with it. Further, the present study outlines the possible directions for future research, in the field of workplace design and its impact on the employee productivity.

ACKNOWLEDGEMENT

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LIST OF ABBREVIATIONS

ICTA   Information and Communication Technology Agency

IT   Information Technology

ICT   Information and Communications Technology

SPSS   Statistical Package for the Social Sciences

VIF   Variance Inflation Factor

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1. INTRODUCTION

This chapter introduces the research problem and provides information associated with the background and the motivation of the study. The chapter also outlines the significance of the study and research objectives.

1.1. Background

Employees are one of the most important assets of an organization in any industry (Mathews and Khann, 2016; Lindell, 2010). Their productivity and wellbeing are the key to the organizational success and the county's economy (Saha, 2016). Today, the workplace is very diverse and subject to continuous change (Saha, 2016). The typical employer- employee relationship has changed. Employees spend major part of their life at their workplace. Hence, the workplace and its environment play an important role to maintain better employee productivity.

In the current business world, employment opportunities have been constantly increasing. Hence, the employers need to come up with new and innovative strategies in order to recruit and retain well-qualified employees for their companies (Leblebici, 2012). A common method of attracting employees to an organizations is higher salaries and compensations. Even though, an attractive compensation package can act as a good motivation, its impact on the employee productivity is limited to a short period (Leblebici, 2012).

The workplace environment can have an effect on the quality and quantity of work done by employees (Mathews and Khann, 2016). A poor workplace design may significantly hinder the employee productivity, deteriorate employee health and wellbeing, reduce job satisfaction, and cause high absenteeism and turnover (Saha, 2016; Richardson, 2014). A good workplace design can help increase the employee satisfaction, attraction, motivation and retention (Saha, 2016). Further, it will help employers reduce medical costs, decrease absenteeism and employee turnover. This will eventually increase the operational performance of the organization and help the organization gain competitive advantage over rivals.

1.2. Motivation

The workplace design can have both positive and negative impacts on employee morale, productivity, job satisfaction, health and wellbeing (Saha, 2016). In today's competitive business environment, organizations can no longer afford to waste the potential of their workforce (El-Zeiny, 2012). Hence, the management needs to ensure their workplace design helps in attracting, retaining and motivating their employees (Saha, 2016).

Even though the workplace seems to be very important in the current business context, it is surprising that its effect on employee productivity and job satisfaction has been ignored by most of the researchers (Roelofsen, 2002). As per Saha (2016), there is a visible research gap in identifying and assessing the workplace design factors which contribute in increasing the employee productivity.

Due to the increased competition, companies are now investing in systems and new methods of doing work effectively to improve employee productivity. The work environment can be considered one of the main focuses among them (Riaz, Shoaib, and Sarfraz, 2017). However, not much evidence is given in literature, questioning the effectiveness of these investments on achieving the ultimate goal of improving employee productivity and organizational performance.

Every industry is different in terms of the workload, work pressure and stress. (Riaz, Shoaib, and Sarfraz, 2017). Most of the time, employees in IT companies work on computers, in stressful conditions and under tight deadlines (Riaz, Shoaib, and Sarfraz, 2017). Hence, the influence of workplace design on employee productivity in software industry may differ from that of in other industries.

Above factors show the importance of assessing the relationship between workplace design and employee productivity and determining the key factors of the workplace design which contribute in increasing the employee productivity in the software industry. Moreover, according to literature, this does not seem to have been paid much attention in Sri Lanka. Hence, this emphasizes the need for research on the same in Sri Lankan context as well.

1.3. Problem Statement

Employee productivity and wellbeing are key success factors for any organization in current business environment. The workplace and its environment play an important role to maintain better employee productivity. A poor workplace design may significantly hinder the employee productivity, health and wellbeing, motivation and job satisfaction. This will eventually affect the operational performance and financial wellbeing of the organization.

Given the importance of the workplace, it seems most researchers have ignored the aspects of workplace and its effect on employee productivity and job satisfaction. Moreover, the effect of workplace design on employee productivity in software industry and other industries may not be the same due to the dynamic nature of the work carried out in the software industry. Hence, it is important to identify and assess the relationship between the workplace design and employee productivity in software industry and thereby improving employee productivity and the overall performance of the company.

Hence, the research question would be:

What is the relationship between workplace design and employee productivity in the software industry?

1.4. Research Objectives

The primary goal of this study is to assess the relationship between the workplace design and employee productivity in software industry. The objectives of this study are as follows.

- Analyse the co-relation between the workplace design and employee productivity in the software industry
- Identify the key factors of the workplace design which affect the employee productivity
- Provide recommendations to improve the workplace design for better employee productivity

1.5. Research Design

Analysing the relationship between workplace design and the productivity of software professionals in Sri Lanka is the primary interest of this study. The target population of the study is the software professionals who work in large scale software companies in Sri Lanka with 100 or more employees.

Since the study's main interest is describing the co-relation between the workplace design and the productivity of software professionals, it would be a correlational study by nature. Further, the research attempts to identify the factors of the workplace which have a significant impact on the productivity of software professionals in Sri Lanka.

In the initial stage of this research, an extensive literature review will be undertaken to find out the key workplace factors that have shown to be having an effect on the employee productivity. Based on previous research work and expert opinion, the theoretical framework will then be developed to address the research problem.

A questionnaire instrument will be developed to capture the research variables and dimensions and to collect data for further analysis. The questionnaire would be administered adopting stratified random sampling techniques. Based on the analysis and findings, conclusions and recommendations will be drawn.

1.6. Nature and Form of the Results

- Recognition of the relationship that exists between the workplace design and the employee productivity in the software industry in Sri Lanka
- Identification of key workplace design factors which have a significant impact on the productivity of software professionals

1.7. Structure of the Thesis

Five chapters are included in this thesis along with a summary for each chapter.

The Chapter 1 introduces the research problem and outlines the background, motivation of the research and research objectives.

The Chapter 2 gives an extensive literature review covering an overview of employee productivity, workplace design factors, and the relationship between workplace design and employee productivity.

The Chapter 3 introduces the research methodology of the study, including a detailed description on the theoretical framework, research variables, questionnaire instrument development, research method, target population and hypothesis development.

The Chapter 4 provides a detailed discussion on the results obtained, observations and findings, based on the data analysis conducted.

The Chapter 5 presents the conclusion and recommendations, limitations of the study and the direction for future research work.

2. LITERATURE REVIEW

The literature on employee productivity, workplace design, and the relationship of workplace design and employee productivity is reviewed and presented in this chapter. Finally, the chapter presents a conclusion from the literature reviewed and gives the problem statement.

2.1. Employee Productivity

Productivity can be defined as what people can produce with the least effort (Roelofsen, 2002). Sutermeister (1976) defines productivity as the output per employee hour. Wyon (1986) states that when the organizational performance and the quality of work are increased, the productivity is also increased. Roelofsen, (2002) also holds a similar idea on performance, quality and productivity. According to Roelofsen, (2002), when the performance is increased, it will eventually increase the quantity and quality of the work produced by the employee in a given period and reduce absenteeism of employees.

Productivity in some occupations such as manufacturing industries can be measured by total items/products produced by the employee in a workday. However, the productivity in service oriented occupations is more challenging to assess as service industries are involved in producing intangible products (Koopman et al., 2002).

Absenteeism reduces employee productivity and can be considered as a determinant of health related productivity (Koopman et al., 2002). On the other hand, even though employees are physically present in their jobs, their productivity and quality of work may not be up to the expected level.

McNeese-Smith (1996) examined the use of five leadership behaviors by hospital managers and their relationships with employee productivity, job satisfaction and organizational commitment. In this study, the productivity was measured by a 'productivity scale' which was a self-assessment of the employee's contribution to unit productivity in relation to 15 dimensions (McNeese-Smith, 1996). The productivity indicators used to develop the productivity scale were identified from literature and evaluated by a set of experts in hospital productivity. The resulting indicators included

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goal attainment for unit and for the organization, supply and linen cost, labor costs, service, professional growth, meeting productivity goals, meeting deadlines, being well organized, accomplishing a large amount of work, accuracy, absenteeism, prevention of turnover, and departmental problem solving (McNeese-Smith, 1996).

Njururi (2016) states that the productivity in service industries can be measured through the number of tasks performed, number of customers served in a given time period, the quality of the service delivered and the ability to achieve performance deadlines set.

Al Horr et al. (2016) suggest that indirect methods such as absenteeism in employees, the number of hours worked each week, the number of grievances filed and employee turnover can be used to measure the employee productivity, besides the self-reported productivity by employees.

Self-measured productivity is one of the methods which had been mostly used by researchers who assessed the relationship between the workplace and employee productivity (Fassoulis and Alexopoulos, 2015). In this method, employees are asked to rate the impact of number of characteristics of their workplace on their productivity on as scale (Fassoulis and Alexopoulos, 2015). Hameed and Amjad (2009) examined the relationship between the design of the organization and productivity in banking sector in Pakistan. In this study, the authors have used personal's subjective assessments to measure employee productivity. Surveys or questionnaires can usually be used to collect data on personal subjective assessment on the productivity (Hameed and Amjad, 2009).

Duffy (1992) argues that research carried out in the arear of workplace design has to be based on the "user perspective".

2.2. Workplace Design

Initially, the premises and equipment were considered as the workplace of an organization (Fassoulis and Alexopoulos, 2015). However, in the today's work environment, workplace can be defined as a tool which motivates employees to work effectively, promotes creativity and innovation and increases employee productivity,

as opposed to defining workplace only in terms of premises and equipment (Fassoulis and Alexopoulos, 2015).

Hameed and Amjad (2009) emphasise the importance of the workplace design for better employee productivity. Fassoulis and Alexopoulos (2015) state that a proper workplace with more flexibility and comfort is required for innovative businesses in order to attain higher productivity.

El-Zeiny (2012) states that workplace design contributes in improving job satisfaction and employee productivity. It is also a key factor for organizational success as a good workplace design improves work quantity and quality and decreases absenteeism and employee turnover. Today, most of the companies use interior design to attract and retain employees, and thereby achieving company's goals. Employees and job seekers also consider the physical work environment as one of the key factors when making decisions on accepting or leaving jobs (El-Zeiny, 2012).

A workplace consists of many factors which can have a positive or negative effect on employee productivity. Some of the key factors which promote workplace design are given below.

Lighting

Lighting is one of the key factors for a comfortable workplace (Saha, 2016). In today's business world, employees spend most of their time in the workplace. Hence, it is important to have proper indoor lighting and daylighting to work effectively. Gutnick (2007) states that employees are more comfortable when they get to work in lower lighting level. However, it is recommended to provide employees with individual task lighting with the ability to control the level of lighting to offer them more flexibility and make them more comfortable (Gutnick, 2007).

The strength and power of the light can cause eye strain. It can also increase the exhaustion and stress which will eventually impact the usual sleeping pattern and performance of the employees (Riaz et al., 2017).

High level of light enhances the employee attention and it is good for reading documents with small text. (Gutnick, 2007). For meetings, it is recommended to have medium light. For tasks which require concentration and decision making, it is recommended to have a lower level of light as it enhance employee's focus and memory. There should be a balance of direct, indirect and task oriented light in any workplace (Gutnick, 2007). Lighting requirement may also differ based on employee's age, vision or preference (Gutnick, 2007).

It is found that daylight/natural light from windows provides improved comfort level and lack of adequate natural light in the workplace can increase employee's depression, tension and job dissatisfaction (Gutnick, 2007). Windows also provide natural views which can affect employee productivity in a positive manner (Al Horr et al., 2016). Hence, a workplace with sufficient daylighting can contribute toward enhancing employee productivity.

Visual discomfort can be caused by the excess daylight or artificial light. Insufficient lighting can lead to employee dissatisfaction and visual discomfort (Al Horr et al., 2016). VDT screen glare and surface reflections can make the employees stressed and exhausted (Gutnick, 2007). Hence, it is important to choose interior colours and work surfaces to minimize VDT screen glare and other surface reflections.

Colour

Emotional and psychological behaviour of employees can be affected by the colour (Gutnick, 2007). It has been found that humans have different reactions to different colours. Red, for example has been shown to increase the stress whereas the blue colour tend to reduce stress and make people more relaxed (Gutnick, 2007). Green colour resembles the natural environment and make you feel calm (Al Horr et al., 2016). It is important to choose colours for today's offices based on the tasks and activities which are performed in a given room/area.

Aroma

According to Welch (1996), unpleasant odours increase the heart rate. It can intensify the stress level and decrease the productivity (Welch, 1996). Good HVAC systems that exclude a lavender system can be used as a solution for this (Welch, 1996). Companies can explore various fragrances through air conditioning systems and come up with suitable fragrances which promote relaxation. Having said that, it is important that employees' allergies and guidelines on indoor air quality are also considered when above is implemented by organizations.

Noise

Most of the tasks require a high level of concentration and noise control in order for employees to work effectively (Al Horr et al., 2016). Hence, noise can be considered an important factor to be taken into account in workplace design. External and internal sources can cause noise in a workplace. External sounds include traffic, the public, air traffic, machinery etc. Employees' conversations, background speech and sounds of machines and equipment can be considered as Internal noises (Banbury and Berry, 2005).

The neutral sound pressure of a typical air-conditioned office is between 45 dB and 70 dB (MUI and WONG, 2006). The level of noise which is greater than 85dB can affect the employee performance negatively and lead to dissatisfaction of employees (Riaz et al., 2017).

When the workplace is noisy, employees can get distracted, feel not having enough privacy and will not be able to focus on their work properly (Riaz et al., 2017). Further,

it could lead to privacy issues, stress and anxiety which will eventually result in decreased productivity and long term health problems for employees (Al Horr et al., 2016).

Keeping the background noise in a workplace at a low level will enable organizations to achieve acoustic comfort (Al Horr et al., 2016). Sound absorbing materials can also be used for rooms in order to reduce acoustic discomfort (Al Horr et al., 2016).

Privacy

Allie (1996) found that employees would be stressed out due to not having adequate privacy at the workplace. Most of the office tasks require a greater level of concentration and minimal distraction. Further, the level of tolerance with regards to privacy can differ from one individual to another (Al Horr et al., 2016). Hence, a variety of solutions should be designed to address the privacy issue in working environments (Al Horr et al., 2016).

Temperature and Ventilation

People work in different climate conditions. Temperature can have an impact on employee productivity and increased temperature can lead to stress and health problems for employees (Riaz et al., 2017). It has been found that extremely hot and cold temperature can affect the employee performance negatively (Riaz et al., 2017).

Ventilation is used to control the air flow in a building, remove carbon dioxide in the air and to supply fresh air continuously (Kosonen and Tan, 2004). Higher the ventilation rate, better the quality of indoor air. When the indoor air quality is low, it can lead to Sick Building Syndrome (SBS) symptoms and reduced productivity (Kosonen and Tan, 2004).

Different ventilation systems exist in the market such as naturally ventilated systems, hybrid/mix mode systems and mechanically ventilated systems etc. in order to regulate the ventilation rate of buildings (Al Horr et al., 2016). Companies must select a ventilation system based on their environmental factors, building type, employee behaviour patterns etc. (J. Kim and de Dear, 2012).

Ergonomic Furniture

Office furniture comprises of desks, chairs, the filing system, shelves, drawers, etc. These components have their own role to play in terms of making the workplace effective (Saha, 2016). Comfortable office furniture can have an impact on employee productivity health as employees are supposed to work with them during the period that they are present in the office. If the furniture is uncomfortable and inconvenient, it can affect employees' productivity and efficiency (Saha, 2016). If the furniture is not ergonomic, it can increase physical discomfort, fatigue, and tension, cause health problems for employees and have an adverse effect on their productivity (Saha, 2016). Hence, it is important to consider the ergonomics of furniture when buying office furniture as it could positively affect the employees both physically and psychologically, decrease absenteeism and eventually reduce medical cost for both the employer and employee (Gutnick, 2007).

Ergonomic designs which include adjustable chairs, wall colour and workspace design contribute to reducing the stress level of employees (Miles, 2000). Karen (2004) stated that there is an increasing demand for ergonomic chairs as it reduces employee stress, enhances comfort and good posture.

Individual Design Controls

Different types of design controls can be found in work environment, such as operable windows, furniture with adjustable ergonomic features, dimmable lighting and task lighting (Saha, 2016). These allow employees to control their workplace environment and maximize their personal comfort (Saha, 2016). Vangen (1999) shows that employee's inability to control his/her work environment can cause workplace stress. Hence, it is important to provide employees with workplace design elements, including the ability for them to control their work environment to a certain level to help them manage their work stress.

Office Layout

Office layout can be considered the physical environment which is a part of the culture of the organization (Al Horr et al., 2016). The behaviour of employees can be influenced by the office layout.

Today, people work in a more open and collaborative environment (Gutnick, 2007). Open plan offices have been used not only to save cost and space, but also to increase interaction of employees (Gutnick, 2007).

Open plan offices allow employees to have meetings in public and enables management to oversee employees (Asirvatham, 1999). It also encourages employees to have good interactions with their colleagues and quick and easy problem solving (Gutnick, 2007). However, there is a risk of employees being distracted and dissatisfied due to noise and lack of privacy in open plan offices (Al Horr et al., 2016).

Van Der Voordt (2004) recommends combi office which is a hybrid of private and open plan offices. Combi offices allow employees to interact with other employees easily, concentrate on their work properly and transfer information quickly. It also allows employees to enjoy the benefits of both traditional and open plan offices (Al Horr et al., 2016).

Recreation Amenities

Recreational activities can be defined as physical activity, social interaction and mental relaxation (Aksoy, Çankaya, and Yalçın Taşmektepligil, 2017). Recreation amenities are offered in many workplaces in the current business world (Lacanienta, 2016). Recreation amenities include facilities such as relaxation centres, 24-hour gyms, yoga studios, video game rooms, basketball courts, rock climbing walls, meditation rooms, libraries etc. (Lacanienta, 2016). Alker, Malanca, Pottage, and O'Brien (2014) recommend four types of primary amenities to be offered in a work environment:

i. Healthcare/Clinic

Healthcare facility is a basic need for any human being. It is good to have healthcare facilities within the proximity of the workplace as it promotes healthy life for employees and makes employees' life easy by saving time to travel from workplace to clinic. Not only employees, employers will also have direct and indirect benefits such as less time being spent by employees in travelling during work hours, employees being health conscious which in turn reduces sick leaves taken by employees.

ii. Recreational spaces/ sports facilities

It is important to provide employees with recreational spaces to relax during work time. Green surrounding around the office will also improve employee wellbeing. Sport facilities in workplace will include numerous benefits for employees such as, providing better access to sport facilities, improving team building exercises, reducing stress, saving time spent on travelling to gym, assisting employees in maintaining better health. These activities will eventually help employees to improve their well-being and productivity (Al Horr et al., 2016).

iii. Entertainment options

Entertainment options can be considered a method of providing relaxation and enjoyment for employees (Al Horr et al., 2016). Entertainment options such as theatres and cinemas will contribute towards developing team bond and strength.

iv. Childcare facilities

Childcare facilities near workplace can be considered a value addition for the employer-employee relationship. Childcare facilities provide employers and employees with direct benefits (Al Horr et al., 2016). Employees can work peacefully with no stress since their child is being cared nearby. Studies indicate that best qualified employees can be attracted by providing childcare facilities in the workplace. It will also contribute toward improving employee productivity (Al Horr et al., 2016).

Companies make huge investments in recreational amenities in their workplace to attract and retain best employees, help them work long hours, increase their productivity and acknowledge employees' hard work (Lacanienta, 2016). Further, some organizations offer recreation amenities to create a modernized workplace with fun (Writer, 2011) and build a good workplace culture.

2.3. Agile Work Environment in Software Industry

Today, most of the software companies are multi-national and work across borders and in different time zones (Johnson et al., 2019). According to Harris (2015), there is

a need for organizations to be agile and have a good connectivity with employees in order to respond to continuous changes in technological innovations and adapt to volatile market conditions. Similarly, the workplace should change and be set up to support agile teams and work that is being undertaken and to promote the connectivity and engagement (Harris, 2015).

In recent years, agile software development methodologies have become increasingly popular to support iterations as opposed to traditional software development methodologies (Sohaib and Khan, 2010). In agile methods, software is developed in a short period, eliminating comprehensive documents such as specifications, design documents, quality reports etc. (Mishra et al., 2012). Hence, communication, collaboration and coordination among employees become vital in agile methods (Mishra et al., 2012).

One of the most effective communication channels is considered face-to-face communication as employees can get instant feedback from others (Crowston et al., 2007) . However, it is important that organizations have tools such as papers, white boards, electronic displays and other systems to store the knowledge acquired from face-to-face communications and to make it available and accessible to everyone who work on the same project (Mishra et al., 2012).

It has been found that physical environment of the workplace can influence communication, collaboration and coordination (Mishra et al., 2012). Small and self-organized teams are more effective in agile software projects as they allow software professionals to enjoy a greater level of freedom, autonomy, responsibility, collaboration and commitment (Hoda and Murugesan, 2016). Further, it is advised individuals who work in the same team and business experts to be physically placed closely, so that it would enable them to interact and communicate with each other easily (Mishra et al., 2012).

According to (Heerwagen et al., 2004), spaces, furniture and technology are required in a collaborative work environment to support individual and group interactions. The workspace should have moveable and adjustable furniture and those should be able to be shared by different work groups to facilitate spontaneous and informal meetings

(Heerwagen et al., 2004). In addition to shared desks, agile workplaces tend to have informal meeting space, break out areas, collaborative and contemplative spaces to enhance collaboration and interaction of the employees (Keeling et al., 2015).

Mishra et al. (2012) show that open work environment in agile software development improves the coordination, collaboration and awareness among employees. White boards and status boards also play a major role in coordination of tasks within the team and among different teams and provide required information and thereby reducing unnecessary communication (Mishra et al., 2012).

Keeling et al. (2015) state that open work environment lead to poor privacy and affect crowding. Hence, it is suggested that employers should pay a close attention on improving the privacy in the workplace and have alternate space for private conversations and to work from, in order to get the best out of agile workplaces (Keeling et al., 2015).

Shahzad et al. (2013) show that there is an impact of organizational culture on employee performance in the software industry. A strong culture within an organization contributes to employees' commitment towards accomplishing organizational goals and increases employee performance (Shahzad et al., 2013).

2.4. Workplace Design and Employee Productivity

Better workplace motivates employees and helps them produce better results (El-Zeiny, 2012). The workplace is mostly designed based on the people who work in the organization and the nature of the work that they do (El-Zeiny, 2012). At the corporate level, overall performance of the organization can be affected by factors such as workplace design and its effect on employee health and productivity.

Fassoulis and Alexopoulos (2015) examined the effect of the workplace on the University of Athen's (UOA) administrative staff's job satisfaction level. 160 UOA administrative staff was used as the sample of the study and questionnaires were used to collect data from them. The main focus of the questionnaires was the level of employee satisfaction and the positive impact on their productivity with respect to 21

aspects of a workspace. It was found that the current workplace did not fulfil UOA's administrative staff's personnel needs and their productivity was reduced due to most of the aspects of the current workplace not being up to standards (Fassoulis and Alexopoulos, 2015). The results also demonstrate the workplace has a significant correlation with job satisfaction of the UOA's administrative staff.

The study contributes to the public sector, which is an area that does not seem to have focussed on by many researchers in the area of this study. The authors have used different aspects of the workplace to assess the job satisfaction of UOA staff. Internal temperature, indoor air quality of the buildings, furniture ergonomics, the possibility for employees to personalize their space, and the operability of the internal layout of the workplaces based on the aspects of the workspace seem to be having a greater impact on the UOA administrative staff's productivity. Authors have provided recommendations for the improvement of the job satisfaction and productivity of UOA administrative staff based on the research outcomes.

The researchers could have identified the differences in the job satisfaction and the productivity of UOA's administrative staff with respect to workplace factors based on demographic characters such as age, gender, education, duration of employment etc. This seems particularly important as a workplace can consist of employees in different generations (Ouye, 2011). Further, researchers have shown that there is a difference in the way a workplace is perceived by working male and female (Kim et al., 2013).

Geethika and Chandrika (2015) examined the relationship between physical working conditions and job satisfaction of operational level employees in the manufacturing industry of Sri Lanka. 70 operational level employees in selected manufacturing companies including machine operators, production helpers, stores helpers and supervisors were used as the sample. The physical working conditions of the selected manufacturing companies were measured in terms of eight dimensions, and fourteen indicators as Work sites (Parking area and Location), Workplace design (Ventilation, Air Conditioning system, Canteen and Social relationships), Illumination (Brightness, Glare and Artificial vs. natural light), Noise, Color Temperature & Humidity, Rest Pauses (Authorized breaks) and Shift work (Geethika and Chandrika, 2015). The

employee's job satisfaction was measured in terms of nine dimensions and fourteen indicators as Health & Safety, Job nature (Achievement, Workload, Responsibility, Cooperation and Supervisor – subordinate relations), Job security, Promotion, Pay, Working groups, Welfare (Improvement), Use of skills and abilities, and Management style & culture (Geethika and Chandrika, 2015). The data was analyzed using the univariate and bivariate analyses. The results of the study show that there is neither positive nor negative relationship between physical working conditions and the job satisfaction of operational level employees in the selected manufacturing companies in Sri Lanka (Geethika and Chandrika, 2015).

Even though the authors have targeted a population of 323 operational level employees in selected manufacturing companies, only 70 of them had been selected as the sample of the study, which represents only 22 percent of the target population. Hence, the sample size of the study is not sufficient for the readers to rely on the findings of the study. According to Geethika and Chandrika (2015), the operational level employees are considered as the lower cluster of the selected company in Sri Lanka. Hence, the education level, awareness and family background of employees might have had an impact on the findings of this study. The results would have been better if authors had analysed the impact of physical working conditions on job satisfaction based on demographic characters of operational level employees such as age, gender, education level etc.

Leblebici (2012) examined the relationship between workplace conditions and employee performance in a private foreign bank in Turkey. The physical and behavioural components of the workplace were investigated and 50 employees in the private bank in Turkey was used for the investigation (Leblebici, 2012). The analysis used both primary and secondary data and a survey was carried out using the call centre staff of the bank to collect data (Leblebici, 2012). The productivity of the employees was taken as the dependent variable. Comfort level and office layout were considered as the physical components whilst the level of interaction and distraction were considered as the behavioural components (Leblebici, 2012).

As per the findings of the study, almost all the respondents strongly agreed on the questions regarding the supervisors, fair treatment and communications. However, the questions on the importance of the physical factors were only agreed on by 58% of employees. As per the rankings of the components, the first two highest ranks for the behavioural part were achieved by emotional factors and relations. The comfort level of the offices seemed to be more vital than the office layout. Further, the overall results of the study revealed that the employees were not satisfied with the workplace's physical conditions. However, the employees were happy with the behavioural conditions of the workplace (Leblebici, 2012). This shows that the behavioural workplace affects the employee performance than the physical workplace environment.

Even though there were 300 employees worked in the department, the authors had only considered 50 employees for the survey. The results would have changed, if a larger sample including other department's employees were considered for the survey. Further, analysis of demographic differences towards the association between workplace environment and productivity of employees in the bank would have been an interesting extension of the study.

Hameed and Amjad (2009) also examined the relationship between office design and employee productivity in banking organizations in Abbottabad, Pakistan. The sample of the study included 105 employees from 21 bank branches in Abbottabad. A structured questionnaire was used to collect primary data. The information on the office design was also collected using observations. The relationship between the office design and employee productivity was analysed using five indicators of office design such as furniture, noise, temperature, lighting and spatial arrangement.

The results showed that office design has a significant effect on the employees. Results also showed that the main concern of female employees was the workplace surrounding. Lighting seemed to be the main concern for male respondents, followed by spatial arrangement.

Authors have given recommendations for the management taking the results of the analysis into account. This study gives justifications as to why office design should be considered as an important factor in enhancing the employee productivity.

The research paper itself gives the sample size not being diverse enough to cover all organizations operate in Pakistan as a limitation of the study (Hameed and Amjad, 2009). Authors have measured the employee productivity based on the subjective productivity measurement. They could have also used some other objective method to measure the employee productivity to improve the reliability of overall results of the study.

El-Zeiny (2012) analysed the relationship between the employee performance and the physical work environment in private sector corporations of Egypt. 6 private sector corporations in different industries were used to carry out the study. A sample of 129 employees from these 6 corporations were used for the experiment. Nine indicators of the workplace design such as furniture, noise, temperature, lighting, spatial arrangement, colour, outside view and presence of plants have been considered for the study.

It was found that the workplace interior design has a significant impact on the employee performance. Hence, it can be stated that a good workplace interior design can have a positive impact on employee performance, and consequently the organization's productivity. Authors analysed the data to find out the factor that has a high effect on diminishing employee performance. The average mean ranking indicated that furniture is the most contributing factors towards affecting the employee performance (El-Zeiny, 2012). Next to furniture, it was temperature, which could have a significant impact on employee performance (El-Zeiny, 2012).

Authors have also analysed the responses according to gender and age of the respondents. As per the results, the main concern of female employees was workplace interior design (El-Zeiny, 2012). The results of the male respondents showed that temperature affected them the most, followed by spatial arrangement. The female employees seemed to be affected by temperature compared to the male employees (El-Zeiny, 2012). Baby boom employees were happy with their workplace environment.

Compared to other generations, generation Y employees seemed to be preferring the presence of plants and outside view (El-Zeiny, 2012).

Since the authors have done a thorough data analysis, the results would help the design professionals in Egypt to get a better understanding on workplace factors which make employees perform better and happy at work. Further, the authors have presented adequate facts from literature to support the nine factors used for the study. Even though the authors have selected the sample covering different work areas in private sector, suitability of the size of the sample to represent the entire private sector in Egypt is questionable. Among 129 respondents, 71 percent was male, whereas only 29 percent was female. This may also question the reliability and objectivity of the overall results of the study due to the unequal distribution of the sample among genders.

Saha (2016) analysed the relationship between workplace design factors and employee productivity in the IT industry. The study used organizational factors such as management support, co-worker support, workplace design features, technology and equipment etc. A survey was conducted to collect data in order to identify which organizational factors contribute towards improving employees' ability to perform effectively (Saha, 2016). 150 business lines employees from different scale of companies (small, medium, large) were used as the sample of the study. The organizational factors were categorized into two categories; Work Design and Office Design. The impact of these factors on the productivity of employees in IT companies was analysed in the study.

According to the results, it was found that furniture of the office was not comfortable enough and was not fulfilling employees' needs, which would eventually affect the employee productivity. Results also showed that there was a positive relationship between noise, lighting condition and employee productivity (Saha, 2016). 93.3% of respondents have stated that employee productivity can be significantly increased, if the workplace design has proper conditions and management support (Saha, 2016). 86.6% of respondents have stated open space and comfortable furniture with adjustable ergonomic features would have a substantial impact on employee productivity (Saha,

2016). According to the overall results, the design and physical workplace can have a significant impact on the productivity of the employees (Saha, 2016).

Even though the author has stated that, the questionnaires were sent to 150 business lines to collect data, she has not given the sample size, major characteristics of the sample and the method of sample selection. Hence, the given details of the primary data used for the study are not sufficient for readers to rely on the findings of the study. Further, the researcher could have examined the gender and age differences towards the effects of the two components of workplace environment studied (Work Design and Office Design) on employee productivity.

Riaz, Shoaib, and Sarfraz (2017) observed the relationship between the workplace design and employee health and performance in the software industry of Pakistan. The population of the study included software companies which were registered under Pakistan Software Export Board. The data was collected by conducting close-ended questionnaires. A sample of 285 was selected for the study and 193 responses were used for the analysis. Researchers have used workplace elements such as Furniture, Noise, Temperature, Lighting and Spatial Arrangement to explore the relationship between work design and employee health and performance.

The workplace design seemed to be having a significant negative impact on employee discomfort whilst having a positive impact on the employee performance (Riaz, Shoaib, and Sarfraz, 2017). Further, furniture and lighting found to be affecting the employee health and performance most. Spatial arrangement had the least impact on employee health and performance (Riaz, Shoaib, and Sarfraz, 2017).

The authors have provided recommendations based on the outcomes of the study which will help the management of software houses in Pakistan to improve the organizational performance. The differences of demographic characters towards the effect of the workplace environment on the employee health and performance could have been investigated to arrive at better insights.

Johnson et al. (2019) explored the effect of work environment at Microsoft on the productivity and satisfaction of its software engineers. They used a mixed method which consisted of surveys and interviews, including a sample size of 1159 software

engineers who worked at Microsoft. Personalization, social norms and signals, room composition and atmosphere, work related environment affordances, work area and furniture and productivity strategies were considered as factors for work environments (Johnson et al., 2019).

Johnson et al. (2019) analysed the results using statistical models and perceived productivity and compared them with employees in five job disciplines. The results showed that the ability to work privately with minimal or no disturbance and ability to communicate with the team as significant factors in the physical environment (Johnson et al., 2019). Social norms, proximity to windows, interior design and furniture seemed to matter for software engineers than other job disciplines (Johnson et al., 2019).

The sample size for interviews was 19 and was not sufficient to give a comprehensive understanding for the readers on work environments and their impact on the productivity of software engineers. Productivity and satisfaction in the models were self-measured, which could be subjective. Quantitative measures could have been used for productivity to validate the results. The study was restricted to the setting of Microsoft. Work environment at Microsoft may not be representative of the work environments of small to medium sized software organizations.

2.5. Summary

Employees are one of the most important assets in any industry. Most employees nowadays spend their lives at their workplace more than at home. Hence, their mental status, actions, capabilities and productivity can be greatly influenced by their work environment (Hameed and Amjad, 2009). Thus, the workplace environment plays a vital role in maintaining better employee productivity in any industry.

Employee productivity in service oriented industries is more challenging to assess than manufacturing industries due to the intangible nature of products involved in service industries (Koopman et al., 2002). Literature shows many indirect methods to measure the employee productivity such as absenteeism, number of tasks performed in a given period, meeting deadlines, number of hours worked each week, number of grievances filed, employee turnover, professional growth, accuracy, amount of time spent on a task, work quality, volunteer overtime etc. Self-measured productivity is one of the

methods which had been mostly used by researchers who assessed the relationship between the workplace and employee productivity (Fassoulis and Alexopoulos, 2015). Duffy (1992) argues that research carried out in the arear of workplace design has to be based on the "user perspective".

Initially, the premise and equipment were considered as the workplace (Fassoulis and Alexopoulos, 2015). Hameed and Amjad (2009) emphasise the importance of the workplace design for better employee productivity. Today, most of the companies use interior design to attract and retain employees, and thereby achieving company's goals. Many factors exist in a working environment which can have a positive or negative effect on employee productivity such as lighting, colour, aroma, noise, privacy, temperature, ventilation, ergonomic furniture, individual design controls, office layout etc. In addition to aforementioned traditional workplace factors, many companies in todays' business world spend enormous amounts of money and time on recreation offerings to attract and retain best employees, increase employee productivity, to show appreciation and increase employees' job satisfaction. Alker, Malanca, Pottage, and O'Brien (2014) recommend to have four types of recreation amenities in a workplace. Those are healthcare/clinic, recreational spaces/sport facilities, entertainment options and childcare facilities.

The literature review shows that the workplace design affects employee morale, job satisfaction, health and wellbeing both positively and negatively. Most of the researches show that the workplace design has a significant positive relationship with employee productivity and performance both in private and public sectors.

Among the various factors of workplace environment, Furniture, Noise, Temperature, Lighting and Spatial Arrangement seem to have a significant impact on the employee productivity. Leblebici (2012) investigated the relationship between physical and behavioural conditions of the workplace and employee performance. According to the results, the behavioural workplace environment has a higher impact on employee performance than the physical workplace environment. Hence, it is important to consider both physical and behavioural aspects of the workplace design to improve employee productivity, morale and performance.

El-Zeiny (2012) and (Hameed and Amjad, 2009) analysed the survey responses according to gender and age of the respondents. The results show that differences exist in the responses for different elements in the workplace based on different genders and age groups.

3. RESEARCH METHODOLOGY

This chapter presents the conceptual framework, hypothesis formulated, literature support for conceptual framework, methods of data collection, population, sample and sampling method adopted.

3.1. Conceptual Research Framework

The primary goal of this study is to identify the co-relation between the workplace design and employee productivity in software industry. Figure 3.1 depicts the conceptual framework of this study. The workplace design factors which are perceived to have an impact on the employee productivity are conceptualized in this conceptual research framework.
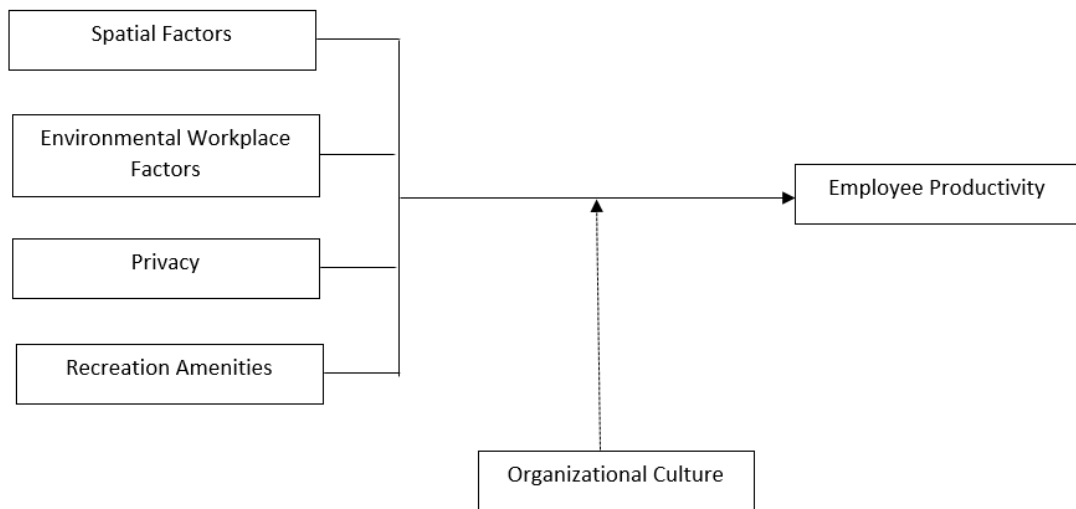
Figure 3.1: Conceptual Research Framework

3.2. Operational Definitions

The previous research work in the area of this study had used questionnaire instruments to explore the association between workplace design and employee productivity. The respondents had been presented with questions to capture the relevant variables. This section operationally defines the concepts presented in the conceptual research framework.

The primary interest of the study is *Employee Productivity*, which is the Dependent Variable.

Table 3.1: Operational definition on Dependent Variable

Variable	Definition	Associated Previous Research
Employee Productivity	What is produced by people with the least effort (Roelofsen, 2002). Sutermeister (1976) defines the productivity as the output per employee hour. The productivity is defined by Wyon (1986) as the increased functional and organizational performance, including quality.	(Hameed and Amjad, 2009), (Fassoulis and Alexopoulos, 2015), (Njururi, 2016), (Al Horr et al., 2016), (McNeese-Smith, 1996), (Van Der Voordt, 2004), (Duffy, 1992)

The behaviour of the Employee Productivity will be explained by four Independent Variables which are outlined in Table 3.2 along with a summary of their associated previous research. They are *Spatial Factors, Environmental Workplace Factors, Privacy and Recreation Amenities*.

Table 3.2: Operational definition on Independent Variables

Variable	Definition	Associated Previous Research
Spatial Factors	The physical environment that affects the behavior of employees (Al Horr et al., 2016)	(Leblebici, 2012), (El-Zeiny, 2012), (Saha, 2016), (Riaz et al., 2017), (Fassoulis and Alexopoulos, 2015), (Hameed and Amjad, 2009), (Gutnick, 2007), (Ikonne and Yacob, 2014)
Environmental Workplace Factors	The external workplace factors which include temperature, humidity, heat and cold, ventilation, lighting, vibration, gases, air	(Geethika and Chandrika, 2015), (Leblebici, 2012), (El-Zeiny, 2012), (Saha, 2016), (Riaz et al., 2017), (Fassoulis and Alexopoulos, 2015), (Hameed and Amjad, 2009), (Gutnick,

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	pressure and gravity etc. (Ikonne and Yacob, 2014)	2007), (Al Horr et al., 2016), (Ikonne and Yacob, 2014)
Privacy	The right to be left alone. The right to control physical interference by others into one's private affairs (Brey, O Hansson, and Palm, 2005)	(El-Zeiny, 2012), (Saha, 2016), (Fassoulis and Alexopoulos, 2015), (Gutnick, 2007), (Ikonne and Yacob, 2014)
Recreation Amenities	Facilities such as relaxation centres, yoga studios, basketball courts, rock climbing walls, 24-hour gyms, video game rooms, recreational areas, meditation rooms, libraries etc. (Lacanienta, 2016).	(Aksoy et al., 2017), (Lacanienta, 2016), (Al Horr et al., 2016)

Further, the study incorporates a moderating variable that might moderate the relationship between the workplace design and the employee productivity. Moderating variable is *Organizational Culture*, which is defined in Table 3.3 along with a summary of associated previous research.

Table 3.3: Operational definition on Moderating Variables

Variable	Definition	Associated Previous Research
Organizational Culture	Saha (2016) defines organizational culture as the method in which the things are done.	(Saha, 2016), (Leblebici, 2012), (Fassoulis & Alexopoulos, 2015)

3.3. Hypothesis Development

Following hypotheses were drawn to determine whether the relationship conceptualized in the conceptual research framework hold true.

Let;

H$_A$: Alternate Hypothesis

H$_0$: Null Hypothesis

<u>**Hypothesis 1**</u>

H1$_A$: There is a relationship between workplace design factors and employee productivity in software industry

H1$_0$: There is no relationship between workplace design factors and employee productivity in software industry

<u>**Hypothesis 2**</u>

H2$_A$: Spatial Factors have a significant impact on the productivity of software professionals

H2$_0$: Spatial Factors do not have a significant impact on the productivity of software professionals

<u>**Hypothesis 3**</u>

H3$_A$: Environmental Workplace Factors have a significant impact on the productivity of software professionals

H3$_0$: Environmental Workplace Factors do not have a significant impact on the productivity of software professionals

<u>**Hypothesis 4**</u>

H4$_A$: Privacy has a significant impact on the productivity of software professionals

H4$_0$: Privacy does not have a significant impact on the productivity of software professionals

Hypothesis 5

H5$_A$: Recreation Amenities have a significant impact on the productivity of software professionals

H5$_0$: Recreation Amenities do not have a significant impact on the productivity of software professionals

Hypothesis 6

H6$_A$: The impact of Spatial Factors on software professionals' productivity is influenced by the Organizational Culture

H6$_0$: The impact of Spatial Factors on software professionals' productivity is not influenced by the Organizational Culture

Hypothesis 7

H7$_A$: The impact of Environmental Workplace Factors on software professionals' productivity is influenced by the Organizational Culture

H7$_0$: The impact of Environmental Workplace Factors on software professionals' productivity is not influenced by the Organizational Culture

Hypothesis 8

H8$_A$: The impact of Privacy on software professionals' productivity is influenced by the Organizational Culture

H8$_0$: The impact of Privacy on software professionals' productivity is not influenced by the Organizational Culture

Hypothesis 9

H9$_A$: The impact of Recreation Amenities on software professionals' productivity is influenced by the Organizational Culture

H9$_0$: The impact of Recreation Amenities on software professionals' productivity is not influenced by the Organizational Culture

Hypothesis 10

H10$_A$: There is a relationship between Employee Productivity and Work Experience in the Current Organization

H10$_0$: There is no relationship between Employee Productivity and Work Experience in the Current Organization

3.4. Questionnaire Instrument Development

Appendix A shows the questionnaire which was used to measure the variables and to capture respondent's perceptions towards workplace design and their productivity. Table 3.4, Table 3.5 and Table 3.6 illustrate a summary of the measures used.

Table 3.4: Instrument Measures of Independent Variables

Variable	Dimension	Item Count	Scale	Questions
Spatial Factors	Ergonomic Furniture and Equipment	3	Five point Likert Scale	SF1, SF2, SF3
	Spatial Arrangement	3	Five point Likert Scale	SF4, SF5, SF6
Environmental Workplace Factors	Noise	1	Five point Likert Scale	EF1
	Temperature	1	Five point Likert Scale	EF2
	Lighting	2	Five point Likert Scale	EF3, EF4
	Ventilation	1	Five point Likert Scale	EF5
Privacy	Privacy Factors	4	Five point Likert Scale	P1, P2, P3, P4
Recreation Amenities	Recreation Amenities Factors	5	Five point Likert Scale	R1, R2, R3, R4, R5

Table 3.5: Instrument Measures of Moderating Variable

Variable	Dimension	Item Count	Scale	Questions
Organizational Culture	Technology Adoption	1	Five point Likert Scale	OC1
	Trainings on ergonomics and workplace safety	1	Five point Likert Scale	OC2
	Collaborative work environment	1	Five point Likert Scale	OC3
	Policies and processes for better workplace	1	Five point Likert Scale	OC4
	Strategic view on workplace	1	Five point Likert Scale	OC5

Table 3.6: Instrument Measures of Dependent Variable

Variable	Dimension	Item Count	Scale	Questions
Employee Productivity	Number of tasks performed in a given period	1	Five point Likert Scale	EP1
	Meeting deadlines	1	Five point Likert Scale	EP2
	Absenteeism due to illness (a form non-productivity)	1	Five point Likert Scale	EP3
	Number of hours worked each week	1	Five point Likert Scale	EP4
	Amount of time spent on a task	1	Five point Likert Scale	EP5

In addition, seven demographic items were included in the questionnaire to capture the respondent's gender, age, job role, software industry type, organization size, work

experience in the current organization and perception on the relationship between workplace design and their productivity (Appendix B).

3.5. Research Method

The target population of this research is the software professionals who work in large scale software companies with 100 or more employees, in Sri Lanka. Since the population is large and the study attempts to explore how the workplace design is associated with the employee productivity, the most appropriate technique is the quantitative method. Previous research carried out in this area such as (Hameed and Amjad, 2009), (Fassoulis and Alexopoulos, 2015) etc. had also used quantitative methods and questionnaires to collect primary data. Interviews cannot be considered suitable for this type of research studies due to time constraints and the risk of not giving frank and honest responses by respondents. Hence, the research was carried out for a selected sample of software professionals sampled based on Stratified Random Sampling. A structured questionnaire was used to gather data.

An online survey was conducted to collect primary data from software professionals in Sri Lanka on their workplace design and productivity. The selected respondents were informed of the research study and its objectives. The respondents were coming from a good educational background. Hence, they could read and understand the questionnaire with minimal guidance. To ensure uniformity, the questions were mostly close ended and based on Likert Scale. A five point Scale was used as it is the most common method of data collection. Few open ended questions were also included in the questionnaire in order to get an idea of respondents' current workplace design and their recommendations/suggestions to improve their current workplace design.

3.6. Population, Sample and Sampling Technique

The target population of this research is the software professionals who work in large scale software companies in Sri Lanka. Software companies with 100 or more employees were considered for the population as large scale software companies tend to invest more in their workplace design in order to motivate their employees and improve employee satisfaction. Hence, focusing on large scale software companies will enable us to arrive at better results and valuable insights.

The sample for this research was the software professionals who work in large scale software companies in Sri Lanka with 100 or more employees and is either member of Sri Lanka Association for Software Industry (SLASI), software Export Association (SEA) or Export Development Board (EDB) (software Industry). Convenient sampling technique (such as through contacts in the organization) was used to select the list of organizations to carry out the research.

3.6.1. Population of the Study

According to the survey conducted by ICTA (2013), the total number of IT professionals in Sri Lanka in the year 2013 is 30,661 and it is estimated to reach 33,918 in 2014 (refer Figure 3.2). Software professionals such as software engineers, quality assurance engineers, system and network administrators, database administrators and developers, project managers, business analysts, IT Managers and technical support contribute to 70% of this ICT workforce (refer Figure 3.3).

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
ICT	7625	9648	11759	14268	15179	15871	17827	21914	24434	26615	30661	33918
Non-ICT	6449	8859	11564	13870	16305	19762	20912	23008	26068	31890	35405	37921
Govt.	1512	1772	1877	1982	2218	2242	2405	3019	3744	5576	5896	6990
BPO						1201	1677	1902	2280	2437	3145	4024
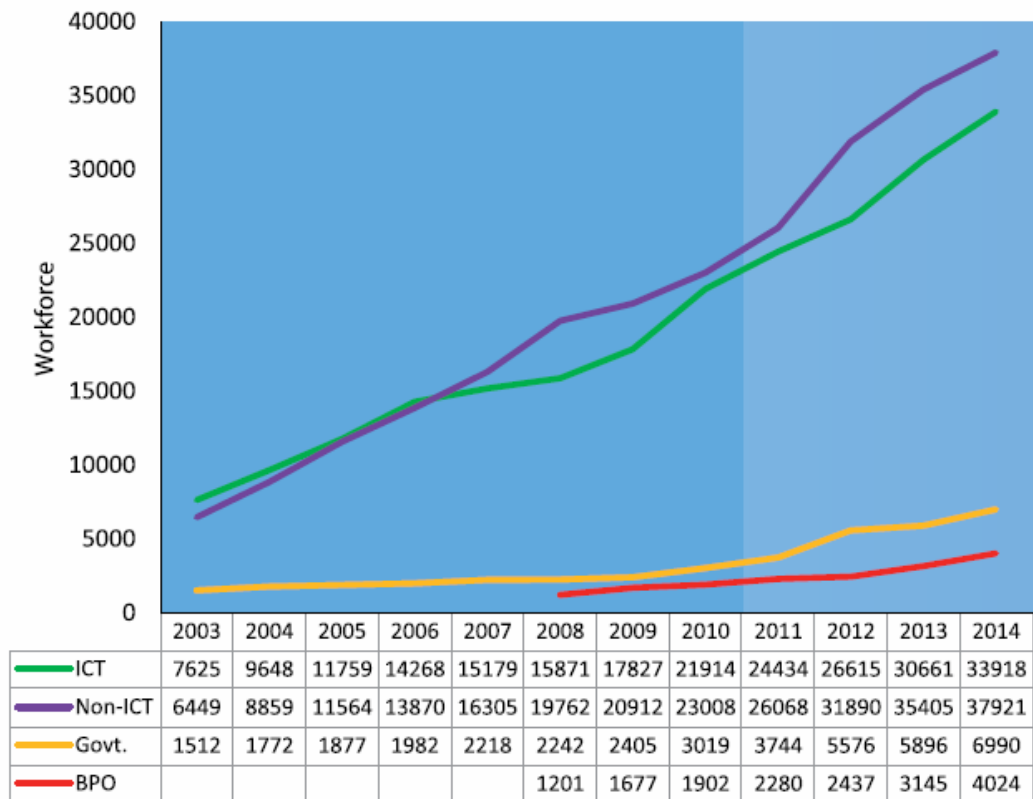
Figure 3.2: Overall IT workforce in 2013

(Source: 2013 IT Workforce Survey – ICTA)

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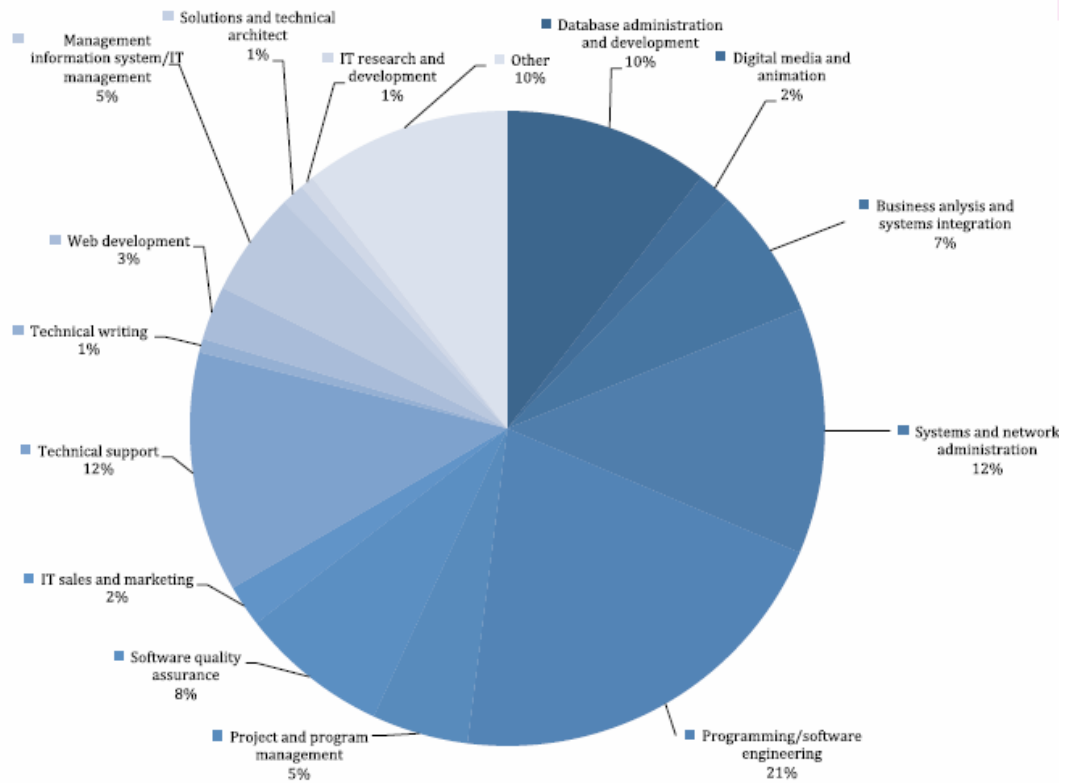
Figure 3.3: Overall IT workforce by job category in 2013

(Source: 2013 IT Workforce Survey – ICTA)

Therefore, approximately the total number of software professionals in Sri Lanka in the IT sector is 33,918 (derived from estimated figure (ICTA, 2013)). The total population for this research study is estimated to 33,918.

3.6.2. Sampling Technique and Sample Size

A sampling design which is good at providing more information with a given sample size is stratification. Using either a simple random sampling or a systematic sampling procedure, a sample can be drawn for each stratum, once the population is stratified. The subjects drawn from each stratum can be either proportionate or disproportionate to the number of elements in the stratum (Sekaran and Bougie, 2006). Therefore, disproportionate stratified random sampling was used for the study.

When 33,918 population is used to derive the sample size at the confidence interval of 0.05 and confidence level of 95%, we arrived at a sample size of 380.

Krejcie and Morgan (1970) state that when the population size is increased, the sample size also increases at a diminishing rate and it remains relatively constant at slightly more than 380. The relationship between sample size and total population is depicted in Figure 3.4.
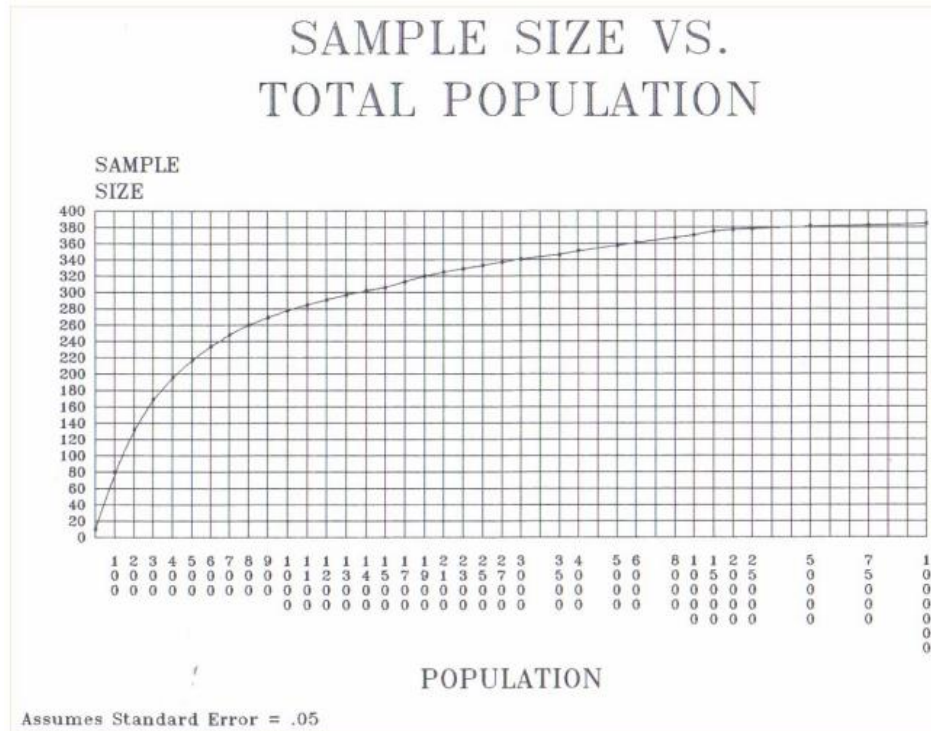
Figure 3.4: The relationship between sample size and total population

(Source: Krejcie and Morgan, 1970)

Hence, even though only the software professionals who work in software organizations in Sri Lanka are considered for the population, sample size of 380 can be considered accurate for the study.

3.7. Process of Data Collection

The questionnaire was distributed among the software professionals who worked in the software organizations in Sri Lanka. A pilot study was initially conducted by focussing on a selected few respondents working in selected software companies to ensure the reliability of the questionnaire. Questionnaire was made available for the target respondents online. The data was analysed and results were interpreted using

the Statistical Package for the Social Sciences (SPSS) version 21 software. The results were presented through graphs, charts, and tables.

4. DATA ANALYSIS

This chapter provides a detailed analysis of the data and a discussion on the statistical results and observations obtained in the research study.

4.1. Preliminary Survey

A pilot survey was conducted prior to full scale research survey to test the questionnaire using 15 selected respondents who work in selected large scale software companies in Sri Lanka. Large scale software companies refer to companies with 100 or more employees. The pilot survey followed a participatory survey method where respondents were informed that they were in a pre-test phase and were asked to provide their comments and suggestions on the preliminary survey along with their responses on questions. The purpose of conducting the pilot survey is to test the reliability of the questionnaire instrument and determine whether the questionnaire is effective in achieving the purpose of the study.

33 items were included in the preliminary survey. The reliability of the preliminary survey was verified by applying Cronbach's Coefficient Alpha to the six variables.

Cronbach's Coefficient Alpha

Cronbach's Coefficient Alpha is used to measure the reliability of the questionnaire between each field and the mean of the whole fields of the questionnaire (Salah, 2010). Cronbach's coefficient alpha value varies between 0.0 and + 1.0. Higher degree of internal consistency is represented by high Cronbach's coefficient values. Generally, a value above 0.7 is an acceptable value for Cronbach's Alpha Coefficient (Sekaran and Bougie, 2006).

Cronbach's Coefficient Alpha obtained for independent variables are illustrated in Table 4.1. For *Environmental Workplace Factors,* Cronbach's Alpha test initially reported a low coefficient value of 0.544. However, when one item was deleted, it gave a reasonable Cronbach's Alpha value of 0.716. Hence, it was decided to remove the item '*I am able to control temperature or airflow in my office*' from the final questionnaire.

When all six items were used to calculate Cronbach's Coefficient Alpha, the test gave a low coefficient value of 0.544 for *Recreation Amenities*. However, after deleting one item we managed to arrive at a reasonable coefficient value of 0.716. Hence, it was decided to remove the item *'Listening to music is allowed and encouraged in my workplace (e.g. playing music in the workplace through speakers so everyone can listen or letting employees to listen to music through their headphones or worker selected music that is delivered by personal listening devices etc.)'* from the final questionnaire.

Table 4.1: Reliability test for the Independent Variables in the Preliminary Survey

Variable	No of Items used to calculate Cronbach's Alpha	No of items eliminated to obtain the reliability	Cronbach's Alpha Coefficient Value
Spatial Factors	6	0	0.761
Environmental Workplace Factors	5	1	0.716
Privacy	4	0	0.814
Recreation Amenities	5	1	0.837

The Moderating Variable '*Organizational Culture'* had five dimensions. Sine only one item was available for each dimension, Cronbach's Alpha was tested for the variable *Organizational Culture*. As shown in Table 4.2, a high coefficient value of 0.812 was able to be achieved. Hence, it was decided to use all five items of *Organizational Culture* variable for the final survey.

Table 4.2: Reliability test for the Moderating Variable in the Preliminary Survey

Variable	No of Items used to calculate Cronbach's Alpha	No of items eliminated to obtain the reliability	Cronbach's Alpha Coefficient Value
Organizational Culture	5	0	0.812

Dependent Variable '*Employee Productivity*' had six dimensions, and each dimension has only one item under it. Hence, Cronbach's Alpha was directly calculated for the variable '*Employee Productivity*'. Initially, the test reported a low coefficient value of 0.536. However, after deleting one item, the coefficient value was increased to 0.634. Hence, it was decided to remove the item '*My quality of work has continually improved*' from the final questionnaire.

Table 4.3: Reliability test for the Dependent Variables in the Preliminary Survey

Variable	No of Items used to calculate Cronbach's Alpha	No of items eliminated to obtain the reliability	Cronbach's Alpha Coefficient Value
Employee Productivity	5	1	0.634

The reliability test on pilot survey eliminated 3 items and the remaining 30 items were used for the final survey of the research study. Final survey entailed 6 items for *Spatial Factors*, 5 items for *Environmental Workplace Factors*, 4 items for *Privacy*, 5 items for *Recreation Ameni*ties, 5 items for *Organizational Culture* and 5 items for *Employee Productivity*.

4.2. Research Survey

The research questionnaire was distributed to total of 450 respondents working in software organizations in Sri Lanka. Out of this, 380 responses representing 84.4% response rate were obtained. These 380 responses were used for further analysis.

4.2.1. Data Pre-processing

All steps involved in constructing the final dataset from the initial raw data are included in data pre-processing stage. It is important to carry out data pre-processing before conducting any analysis in order to obtain accurate results with high quality.

This study only focusses on large scale software companies with 100 or more employees. Hence, as the first step of data pre-processing, the responses obtained from software companies with less than 100 employees were excluded from the dataset. Out of 380 responses, only 37 responses were reported from software companies with less

than 100 employees. After excluding these 37 responses, the final dataset contained 343 responses, which was used for further analysis.

Handling Missing Data

The final dataset was tested for missing data using SPSS version 21 software and it was confirmed that there were not any missing data in the final dataset. Table 4.4 shows SPSS statistics on missing data.

Table 4.4: Summary of missing value analysis

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Mean Overall	343	100.0%	0	0.0%	343	100.0%

(Source: SPSS Output – Missing Value Summary)

Data Transformation

In this step, numeric values were assigned to Likert Scale as shown in Table 4.5. The numbers assigned are not equal to absolute quantities of Likert Scale. The interval between scales are also not represented by the numbers assigned. Those are simply numeric labels assigned in order to select the appropriate method of analysis.

Table 4.5: Summary of data transformation

Item	Strongly Agree	Agree	Partially Agree	Disagree	Strongly Disagree
Scale	5	4	3	2	1

Outlier Detection

It is important to detect and effectively deal with outliers as they affect mean and median, which in turn affect the error of the dataset. SPSS box plot chart was used to identify the outliers in the dataset. The box plot generated by SPSS (refer Figure 4.1) shows that one outlier is present at the lower end, which is case number 189. This was removed from the final dataset to improve the reliability and accuracy of the dataset.
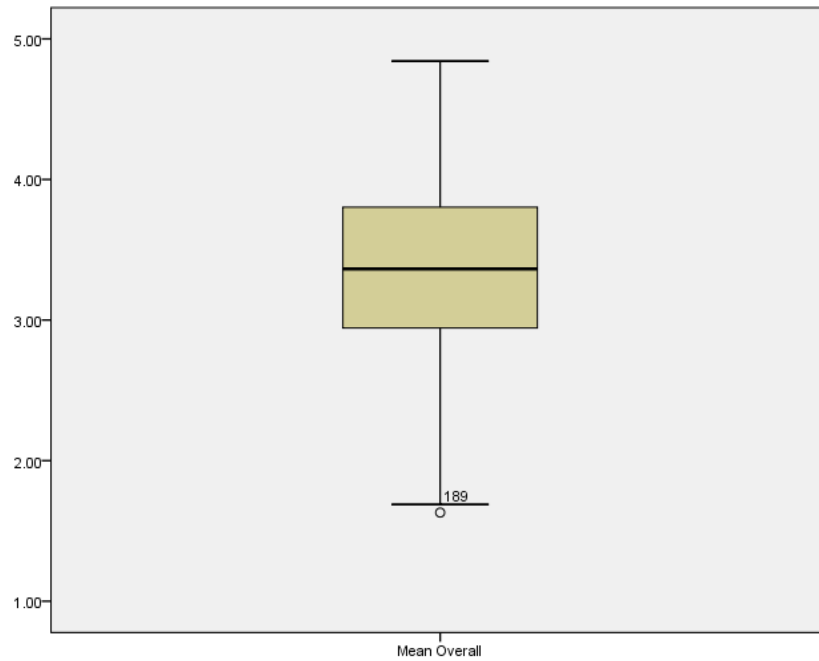
Figure 4.1: Outlier Detection

(Source: SPSS output – outlier test boxplot)

Normality Test

After removing outliers, a normality test was performed to determine whether the sample data has been drawn from a normally distributed population.

The histogram generated by SPSS (refer Figure 4.2) shows that the sample is normally distributed.
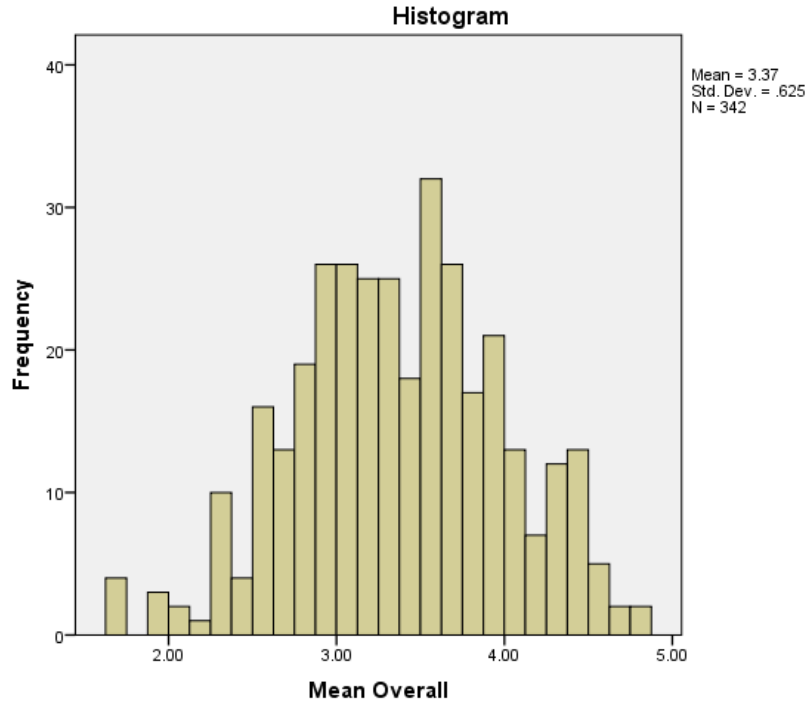
Figure 4.2: Histogram for the sample dataset

(Source: SPSS output – histogram)

Table 4.6 displays statistical information on Shapiro-Wilk test. Since the p value (0.206) is greater than the significance level 0.05, the null hypothesis can be rejected. This means the data is normally distributed.

Table 4.6: Test of normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Mean Overall	.033	342	.200[*]	.994	342	.206

(Source: SPSS output – test of normality)

The normal Q-Q plot generated by SPSS (refer Figure 4.3) also shows that the observed data points are close to expected values. Hence, this gives enough evidence that data is approximately normally distributed.
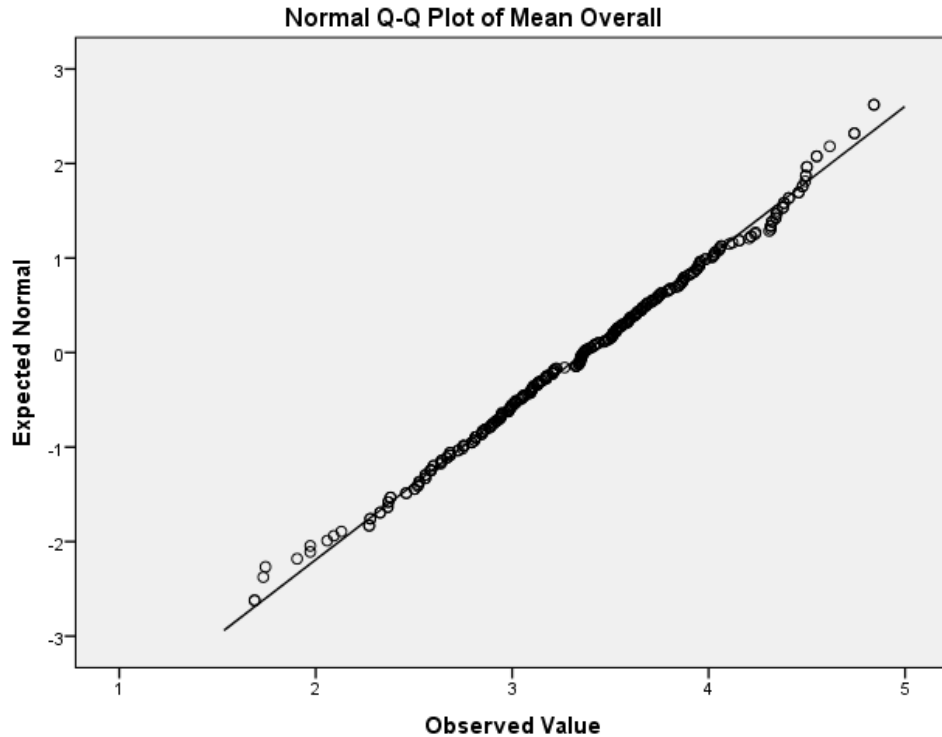
Figure 4.3: Normal Q-Q plot

(Source: SPSS output – Normal Q-Q plot)

4.2.2. Reliability Test

The level of consistency which measures the attribute is referred to the reliability of an instrument (Poilt and Hungler, 1985). When the variation produced for an attribute by an instrument is less, the reliability is high (Salah, 2010).

It is important that a reliability analysis is done before carrying out any data analysis, in order to test the goodness of the questionnaire and to ensure if the study fulfils its objectives and hypothesis.

Cronbach's Alpha Coefficient was used to test the reliability of the questionnaire instrument.

For all 30 items under 6 variables, Cronbach's Coefficient Alpha was generated using SPSS and Table 4.7, Table 4.8 and Table 4.9 show the results.

Generally, a value above 0.7 is an acceptable value for Cronbach's Alpha Coefficient. The value should be above 0.7 for a variable (Sekaran and Bougie, 2006). A value

above 0.6 is considered acceptable for a dimension of a variable (Sekaran and Bougie, 2006).

Table 4.7: Reliability test for Independent Variables

Variable	Dimension	No of Items used to calculate Cronbach's Alpha	No of items eliminated to obtain the reliability	Cronbach's Alpha Coefficient Value
Spatial Factors	Ergonomic Furniture and Equipment	3	0	0.825
	Spatial Arrangement	3	0	0.759
Cronbach's Alpha Coefficient value for Spatial Factors				**0.849**
Environmental Workplace Factors	Environmental Workplace Factors	5	0	0.763
Privacy	Privacy Factors	3	1	0.863
Recreation Amenities	Recreation Amenities Factors	5	0	0.874

For *Spatial Factors*, Cronbach's Coefficient Alpha was calculated dimension wise as there were 3 items each for dimension. Cronbach's Alpha for *Ergonomic Furniture and Equipment* and *Spatial Arrangement* was 0.825 and 0.759 respectively. The variable *Spatial Factors* achieved a Cronbach's Alpha value of 0.849.

Cronbach's Alpha was directly calculated for the variable *Environmental Workplace Factors* as all the dimensions of it (i.e. *Noise, Temperature, and Ventilation*) except for *Lighting* has one item. *Lighting* also had only two items which is not a significant number for Cronbach's Alpha test. *Environmental Workplace Factors* obtained a coefficient value of 0.763.

Privacy variable did not have any dimensions. Hence, Cronbach's alpha was tested for the variable with 4 items. Initially, Cronbach's Alpha test reported a low coefficient value of 0.605. However, when one item was deleted, it gave a reasonable Cronbach's

Alpha value of 0.863. Hence, it was decided to remove the item '*I prefer having a closed office for my privacy*' from the final dataset.

Since *Recreation Amenities* did not have any dimensions, Cronbach's Alpha was directly calculated for the variable with 5 items. The test reported a coefficient value of 0.874.

Table 4.8: Reliability test for the Moderating Variable

Variable	No of Items used to calculate Cronbach's Alpha	No of items eliminated to obtain the reliability	Cronbach's Alpha Coefficient Value
Organizational Culture	5	0	0.897

The Moderating Variable '*Organizational Culture'* had five dimensions. However, only one item was available for each dimension. Hence, Cronbach's Alpha was tested for the variable *Organizational Culture* and it reported a high coefficient value of 0.897 for variable.

Table 4.9: Reliability test for Dependent Variable

Variable	No of Items used to calculate Cronbach's Alpha	No of items eliminated to obtain the reliability	Cronbach's Alpha Coefficient Value
Employee Productivity	5	0	0.611

Even though the Dependent Variable '*Employee Productivity*' had five dimensions, only one item was available for each dimension. Hence, Cronbach's Alpha was directly calculated for the variable '*Employee Productivity'*. The test reported a coefficient value of 0.611. According to Item-Total Statistics generated by SPSS, eliminating any of the item will not increase the coefficient value further. Hence, it was decided to use all five items of Employee Productivity variable for further analysis.

Table 4.10: Item Total Statistics for the variable 'Employee Productivity'

	Cronbach's Alpha if Item Deleted
EP1 - For the past three months, the number of tasks I performed in a day has been increasing.	.548
EP2 - I am able to complete my tasks within the set deadlines	.544
EP3 - In past three months, I was hardly absent due to being sick	.588
EP4 - Number of hours I work each week is higher than a usual working week	.577
EP5 - I am able to generate more than an hour's worth of productivity of each hour	.531

(Source SPSS output – Item Total Statistics of Cronbach's Alpha)

Taber (2018) interprets alpha values using a wide range of different qualitative descriptors which is represented in Figure 4.4. Cronbach's alpha value can vary based on the number of items available for the variable to be tested. When the number of items is increased, Cronbach's Alpha value would reach an acceptable value (Taber, 2018). According to the Figure 4.4, Cronbach's Alpha of 0.611 can be considered 'satisfactory'. Hence, it was decided to continue with the analysis using all five items of the variable *Employee Productivity*.
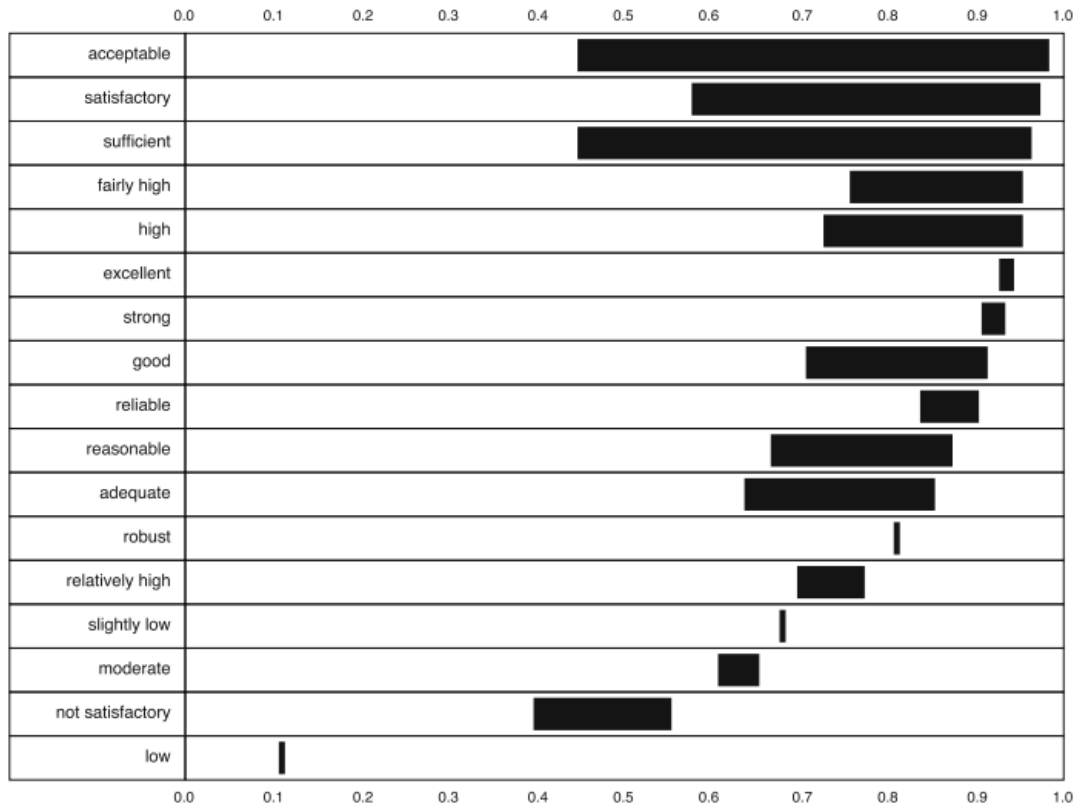
Figure 4.4: Qualitative descriptors for values/ranges of values of Cronbach's alpha in papers in leading science educational journals

(Source: (Taber, 2018))

4.2.3. Descriptive Statistic Analysis

The data was collected from software professionals working in software organizations (private or government organizations) through an online questionnaire. 380 responses were collected within three months' time period. Since the main interest of the study is software organizations with 100 or more employees, the responses obtained from software companies with less than 100 employees were excluded from the dataset. As a result, 37 responses obtained from software organizations with less than 100 employees were omitted from the final dataset. One response was detected as an outlier in data pre-processing stage, hence, subsequent analysis was conducted on the remaining 342 responses.

Appendix B contains the descriptive statistics associated with the study.

The sample contained 228 (66.7%) of males and 114 (33.3%) of females and the *Gender* distribution in the sample is represented by Figure 4.5 and also in the Table B.1 of Appendix B.
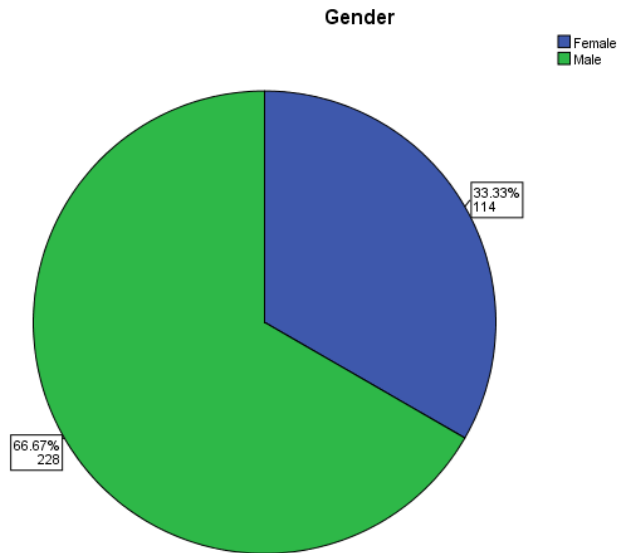
Figure 4.5: Gender distribution in the sample
(Source: SPSS output – Gender distribution)

When the *Age* distribution of the sample is considered, 13 (3.8%) were less than 25 years, 285 (83.3%) were between 26-35 years and 44 (12.9%) were between 36-45 years. The age groups 46-55 years and above 56 years did not have any respondents. The Age distribution of the sample is represented by Figure 4.6 and also Table B.2 of Appendix B.
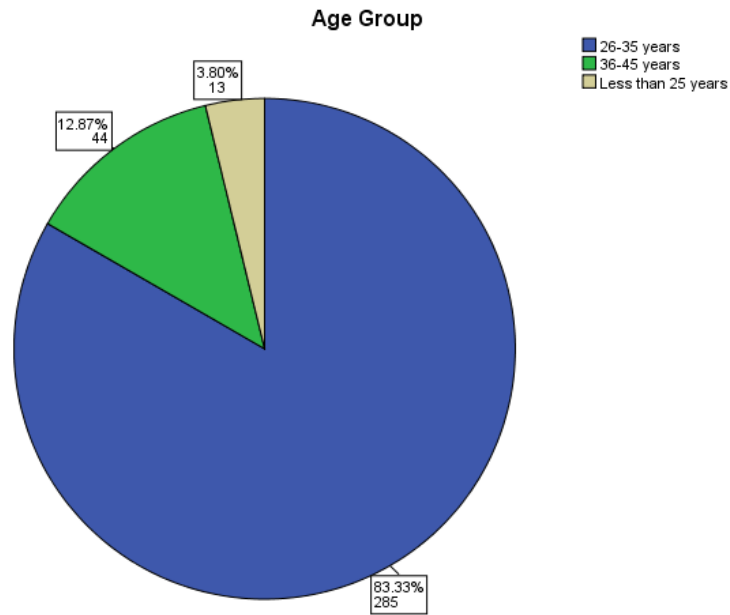
Figure 4.6: Age distribution in the sample

(Source: SPSS output – Age distribution)

Designation/Job Role of the respondents is categorized and represented in Figure 4.7 and also Table B.3 of Appendix B. According to Figure 4.7, 137 (40.1%) were Software Engineers, 53 (15.5%) were Quality Assurance Engineers, 42 (12.3%) were Leads/Managers, and 37 (10.8%) were Business Analysts.
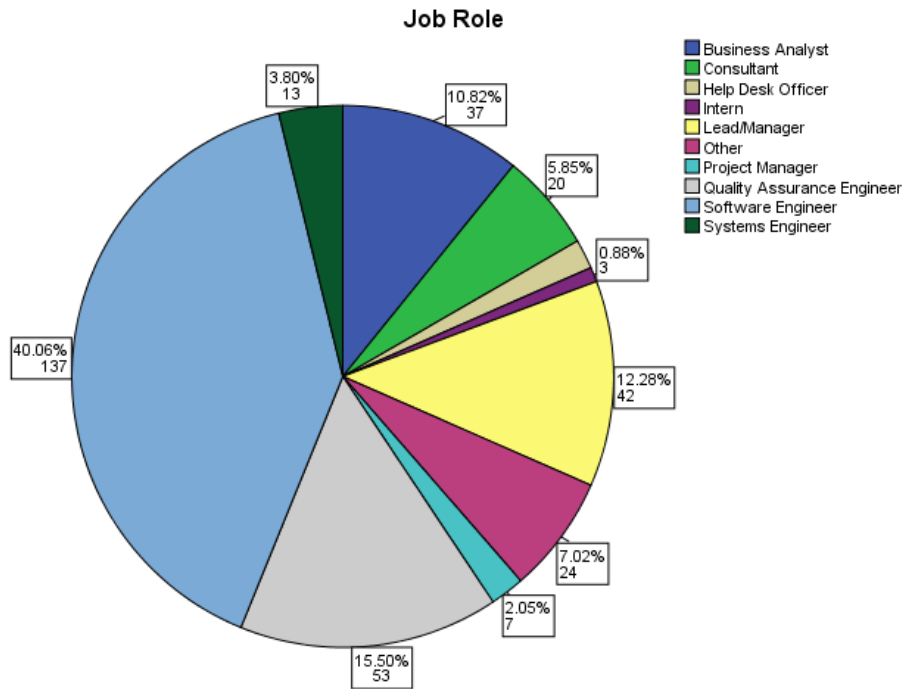
Job Role

Figure 4.7: Designation/Job Role distribution in the sample

(Source: SPSS output – Designation/Job Role distribution)

Figure 4.8 and also Table B.4 of Appendix B shows the *work experience of the respondents in the current organization* (i.e. No of years that have been working for the current organization). Results show that 54 (15.8%) respondents have less than 1 year experience, 107 (31.3%) have 1-3 years of experience, 97 (28.4%) have 3-5 years of experience, 71 (20.8%) have 5-10 years of experience and 13 (3.8%) have more than 10 years of work experience in the current organization.

Work Experience in the current organization

Legend:
- 1-3 years
- 3-5 years
- 5-10 years
- Less than 1 year
- More than 10 years

3.80% — 13
15.79% — 54
31.29% — 107
20.76% — 71
28.36% — 97
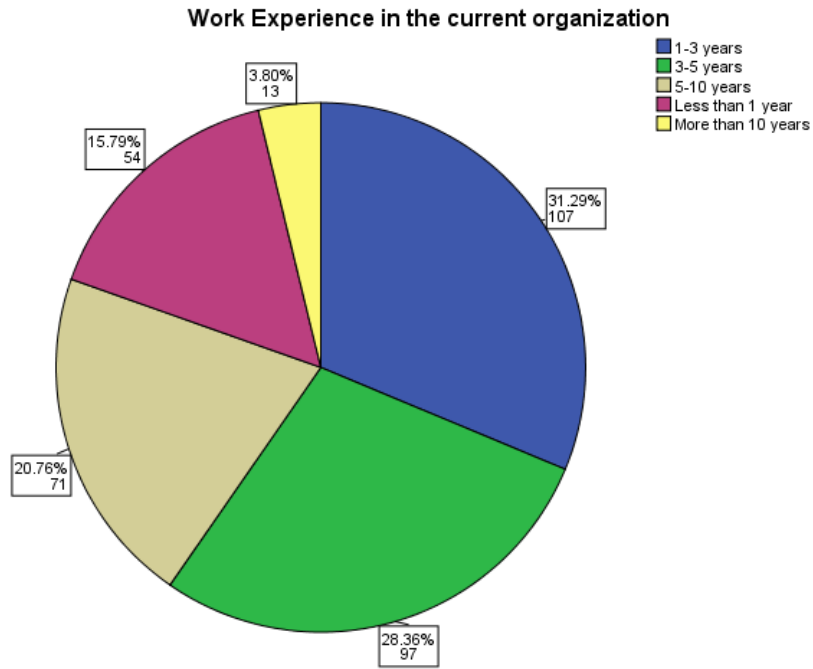
Figure 4.8: Work experience of the respondents in the current organization
(Source: SPSS output – Work experience of the respondents in the current organization)

In the survey, all software organizations were categorized as Less than 100 employees, 100 – 250 employees, 251 – 1000 employees, 1001 – 2500 employees and More than 2500 employees. Since the target population of the study is software companies with 100 or more employees, *organization size (in terms of number of employees)* of the respondents in the sample can be categorized as shown in Figure 4.9 and also in the Table B.5 of Appendix B.

As per the results, 151 (44.2%) of the respondents were from the category of 100 – 250 employees' organizations. 106 (31%) respondents were from organizations with 251-1000 employees. 22 (6.4%) respondents were from organizations with 1001-2500 employees and 63 (18.4%) respondents were from the category of more than 2500 employees' organizations.
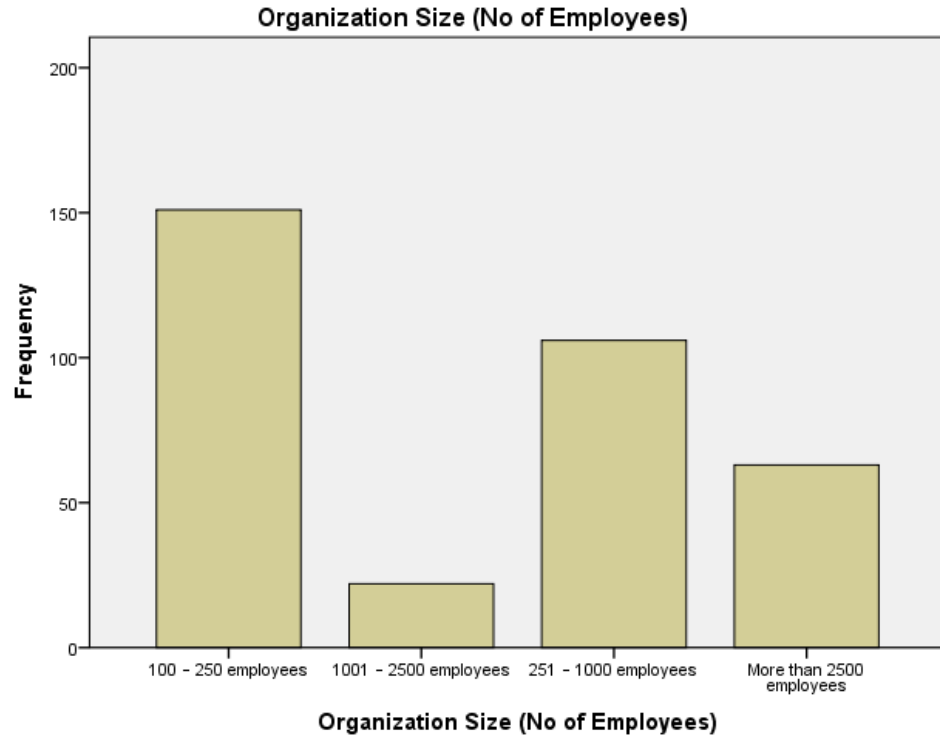
Figure 4.9: Organization size of the respondents (in terms of no of employees)

(Source: SPSS output – Organization size of the respondents)

232 (67.8%) respondents in the sample were from Software-Product companies. 97 (28.4%) respondents were from Software Services companies and the remaining 13 (3.8%) respondents fall into other software companies. Figure 4.10 and Table B.6 of Appendix B show how the respondents categorized by the software industry they work in.

Software Industry Category

- Software Company - Other
- Software Company - Product
- Software Company - Services

3.80%
13

28.36%
97

67.84%
232
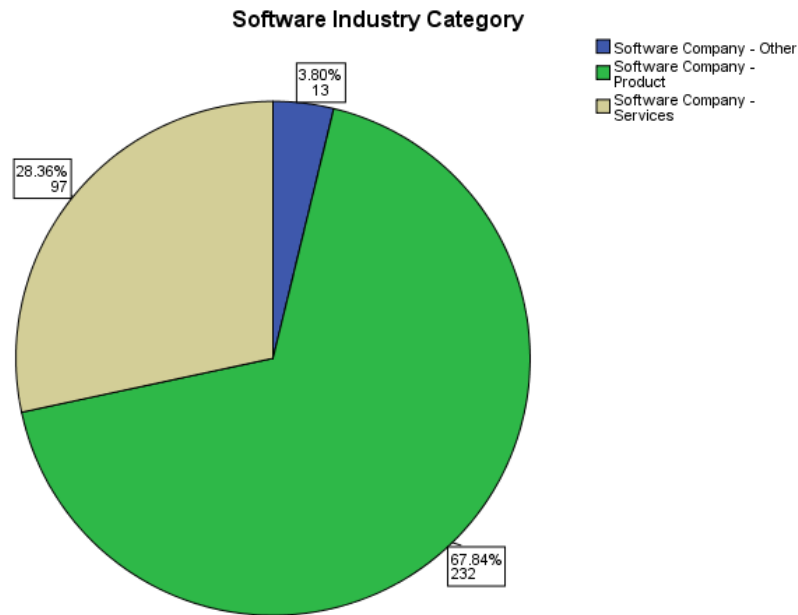
Figure 4.10: Respondents categorized by the software industry they work in
(Source: SPSS output – Respondents categorized by the software industry they work in)

Finally, a question *'Do you think a good workplace design will make a positive impact on your productivity?'* was included in the questionnaire to determine the respondent's perception on the relationship between workplace design and their productivity. 338 (98.8%) of respondents stated that a good workplace will make a positive impact on their productivity. Only 4 respondents (1.2%) think that a good workplace does not have any positive impact on their productivity. Respondent's perception on relationship between workplace and their productivity is shown in Figure 4.11.

Respondent's personal subjective assessment on the relationship between workplace design and their productivity measured by above question will be compared against the results which will be given by the statistical analysis of the data.
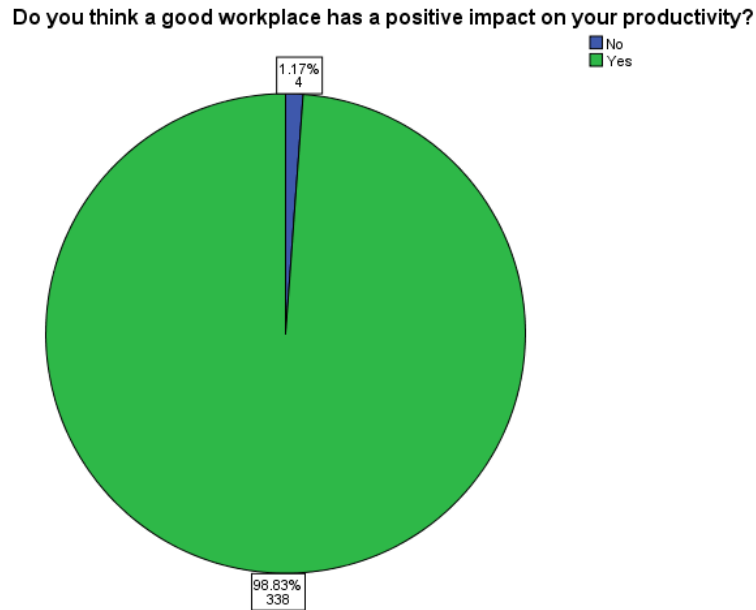
Figure 4.11: Personal subjective assessment on the relationship between workplace design and employee productivity

(Source: SPSS output – Personal subjective assessment on the relationship between workplace design and employee productivity)

In addition to demographic questions, there were six set of questions in the questionnaire to capture respondents' perception on their workplace design and their productivity. The responses were captured in five-point Likert scale.

Table B.7 to Table B.12 of Appendix B present the summary of responses on items under the independent variable *'Spatial Factors'*. The responses for all six items are more towards agree or strongly agree. The mean value of all items is over 3.50, which shows that most of the respondents are fairly happy with the Spatial Factors of their workplaces.

Table B.13 to Table B.17 of Appendix B present the summary of responses on items under independent variable *'Environmental Workplace Factors'*. Most of the respondents agree or partially agree on the questions. The mean value for five items are 3.39, 3.62, 4.02, 3.32 and 3.49. Results show that majority of the respondents are comfortable with temperature and artificial lighting in their workplace. However, they

seem to be moderately satisfied with the level of noise and natural lighting in their workplace.

The summary of the responses on items under the independent variable '*Privacy*' is illustrated in Table B.18 to Table B.21 of Appendix B. According to the results, it can be found that the mean value of the items varies from 2.99 to 3.25. *Privacy* has four items under it and mean values of the items are 3.16, 3.16, 3.25 and 2.99 respectively. It is evident that the majority of the respondents do not prefer closed office. Further, the respondents' level of satisfaction with visual privacy and acoustical privacy is almost equal.

Table B.22 to Table B.26 of Appendix B present the summary of responses on items under independent variable *'Recreation Amenities'*. *Recreation Amenities* has five items under it and the mean value of five items are 2.89, 2.53, 3.18, 2.70 and 2.99. The responses are more towards strongly disagree and disagree. Results clearly show that most of the respondents are not happy with the recreation amenities which are offered by their workplace.

The moderating variable *Organizational Culture* was measured using five items. Tables from B.27 to B.31 of Appendix B present item summary information on *Organizational Culture*. Mean value of five items are 3.59, 3.20, 3.81, 3.46 and 3.23. Most of the respondents have indicated that a collaborative and friendly environment exists in their organizations. It seems that majority of the organizations do not conduct trainings or do not have policies and procedures on ergonomics and workplace safety.

Employee Productivity was measured by five items. A summary of results of items are presented in Tables from B.32 to B.36 of Appendix B. The mean value of items varies from 3.33 to 3.66. Results show that most of the respondents have partially agreed on all items on their productivity. For the ability to meet deadlines, most of the reposes were towards agree and strong agree, which means majority of the respondents were able to meet the set deadlines in past couple of months.

4.2.4. Inferential Statistics - Inter-Item Correlation Analysis

Inter-item correlation was measured using Pearson Correlation Matrix. This test was carried out for each variable to check on the consistency reliability of the questions belong to the respective variable.

Table 4.11, Table 4.12, Table 4.13 and Table 4.14 show that *Spatial Factors, Environmental Workplace Factors, Privacy* and *Recreation Amenities* variable items positively correlate with each other within the respective variable. The cross order correlation among items within the respective variable is significant at 0.01.

Table 4.11: Inter-item correlation of Spatial Factors

Spatial Factors		SF1	SF2	SF3	SF4	SF5	SF6
SF1 -My furniture is comfortable enough so that I can work without getting tired till I leave from office		1	.684**	.566**	.371**	.613**	.469**
	Sig.		.000	.000	.000	.000	.000
SF2 - My furniture is flexible to adjust, rearrange or reorganize my workspace			1	.587**	.296**	.507**	.422**
	Sig.			.000	.000	.000	.000
SF3 - My keyboard and mouse at my workstation allow for natural and comfortable arm placement				1	.311**	.507**	.368**
	Sig.				.000	.000	.000
SF4 - My workplace is open enough to see my colleagues working and allows social interaction between me and other workers					1	.512**	.401**
	Sig.					.000	.000
SF5 - I am comfortable with the space provided and my work area is sufficiently equipped for my typical needs						1	.617**
	Sig.						.000
SF6 - My workplace is sufficiently equipped with different types of work spaces for activities							1
	Sig.						
**. Correlation is significant at the 0.01 level (2-tailed).							

Table 4.12: Inter-item correlation of Environmental Workplace Factors

Environmental Workplace Factors		EF1	EF2	EF3	EF4	EF5
EF1 - My work environment is quiet enough for productive work and does not affect my communication with others		1	.398**	.458**	.340**	.314**
	Sig.		.000	.000	.000	.000
EF2 - The overall temperature of my workspace is conducive enough for productive work			1	.536**	.238**	.429**
	Sig.			.000	.000	.000
EF3 - My workspace is provided with efficient lighting so that I can work easily without strain on my eyes				1	.388**	.415**
	Sig.				.000	.000
EF4 - Ample amount of natural light comes into my office through the number of windows in my work area					1	.491**
	Sig.					.000
EF5 - My workplace has proper ventilation systems which clean and provide adequate level of air humidity						1
	Sig.					
**. Correlation is significant at the 0.01 level (2-tailed).						

Table 4.13: Inter-item correlation of Privacy

Privacy			P1	P2	P3
P1 - My workspace provides visual privacy			1	.656**	.637**
	Sig.			.000	.000
P2- My workspace provides acoustical privacy				1	.738**
	Sig.				.000
P3 - I have enough privacy in my workspace					1
	Sig.					
**. Correlation is significant at the 0.01 level (2-tailed).					

Table 4.14: Inter-item correlation of Recreation Amenities

Recreation Amenities		RC1	RC2	RC3	RC4	RC5
RA1 - My workplace promotes indoor recreational facilities		1	.717**	.481**	.718**	.480**
	Sig.		.000	.000	.000	.000
RA2 - My workplace has outdoor facilities employees can use for physical activity			1	.567**	.642**	.527**
	Sig.			.000	.000	.000

RA3 - My workplace has coffee bars, cafeterias or is very conveniently located with many restaurants					1	.605**	.508**
	Sig.					.000	.000
RA4 - My workplace provides relaxation areas to disconnect from our work for few moments and relax						1	.545**
	Sig.						.000
RA5 - My workplace has onsite or near-site healthcare/ clinic facilities							1
	Sig.						
**. Correlation is significant at the 0.01 level (2-tailed).							

The Moderating Variable *Organizational Culture* consisted of five items and all of those items positively correlated with each other. The cross order correlation among five items is significant at 0.01. A significant positive correlation (r=0.783, Sig=0.000) can be found between *OC4 – Organization's policies and procedures on workplace* and *OC5 – Organization's strategic view on workplace*.

Table 4.15: Inter-item correlation of Organizational Culture

Organizational Culture		**OC1**	**OC2**	**OC3**	**OC4**	**OC5**
OC1 - My organization is open to new technology, and equips employees with tools and technology to encourage mobility and efficient work		1	.603**	.621**	.614**	.589**
	Sig.		.000	.000	.000	.000
OC2 - Trainings are provided as needed to educate employees about ergonomics and workplace safety			1	.643**	.637**	.637**
	Sig.			.000	.000	.000
OC3 - My organization encourages and helps maintain a collaborative and friendly work environment				1	.675**	.601**
	Sig.				.000	.000
OC4 - My organization has policies and processes to maintain a better workplace and efficiency and wellbeing of employees					1	.783**
	Sig.					.000
OC5 - My organization adapts strategic view on workplace to boost productivity and wellbeing of employees						1
	Sig.					
**. Correlation is significant at the 0.01 level (2-tailed).						

Employee Productivity, which is the dependent variable, consisted of five items and all of those items positively correlated with each other. The cross order correlation

among five items is significant at 0.01. However, a weak positive correlation can be found between *EP2 – Meeting deadlines* and *EP4 – Number of hours worked each week.*

Table 4.16: Inter-item correlation of Employee Productivity

Employee Productivity		EP1	EP2	EP3	EP4	EP5
EP1 - For the past three months, the number of tasks I performed in a day has been increasing.		1	.329**	.179**	.247**	.317**
	Sig.		.000	.001	.000	.000
EP2 - I am able to complete my tasks within the set deadlines			1	.251**	.105	.407**
	Sig.			.000	.052	.000
EP3 - In past three months, I was hardly absent due to being sick				1	.270**	.196**
	Sig.				.000	.000
EP4 - Number of hours I work each week is higher than a usual working week					1	.249**
	Sig.					.000
EP5 - I am able to generate more than an hour's worth of productivity of each hour						1
	Sig.					
**. Correlation is significant at the 0.01 level (2-tailed).						

4.2.5. Inferential Statistics – Pearson's Correlation Analysis

Hypothesis 1 was tested using inferential statistics generated with Pearson Correlation Matrix. Standard averaging was used for each variable in order to apply Person's Correlation and assess the relationship. The strength of a linear relationship between two variables can be measured by Person's Correlation (Hameed and Amjad, 2009). The direction and the magnitude of the relationship is indicated by the Correlation Coefficients (Hameed and Amjad, 2009).

Table 4.17 shows the correlation between the factors of workplace design and employee productivity.

Table 4.17: Pearson's Correlation for workplace design factors and employee productivity

Workplace Design Factor	Pearson Correlation (r) Significance	Significance (2-tailed)
Spatial Factors	.478**	.000
Environmental Workplace Factors	.453**	.000
Privacy	.368**	.000
Recreation Amenities	.414**	.000
**. Correlation is significant at the 0.01 level (2-tailed).		

(Source: SPSS Output – Pearson's correlation matrix)

According to the results, Spatial Factors show a positive relationship with Employee Productivity (r = 0.478). The relationship is significant at 0.01. Environmental Workplace Factors also show a significant positive relationship with Employee Productivity. The correlation coefficient (r=0.453) is significant at 0.01. Results also reveal that Privacy has a significant relationship with Employee Productivity (r=0.368) at the significance level of 0.01. For Recreation Amenities, Pearson's correlation reported a positive relationship with Employee Productivity (r=0.414). Since the p value is significant at the significance level 0.01, it can be stated that a significant relationship exists between Recreation Amenities and Employee Productivity.

Aforementioned results show that a direct relationship exists between workplace design factors and employee productivity. Hence, hypothesis $H1_A$ is substantiated.

4.2.6. Regression Analysis

Hypothesis 2-5 were tested by building a multiple linear regression model using SPSS software.

Regression Model

Table 4.18, Table 4.19 and Table 4.20 show regression analysis output for hypothesis 2-5.

Table 4.18: Regression model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.539[a]	.291	.282	.53361
a. Predictors: (Constant), Privacy Revised, Recreation Amenities, Environmental Factors, Spatial Factors				
b. Dependent Variable: Employee Productivity				

(Source: SPSS Output – Regression Model Summary)

Table 4.19: Regression Model - ANOVA

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	39.296	4	9.824	34.502	.000[b]
	Residual	95.956	337	.285		
	Total	135.253	341			
a. Dependent Variable: Employee Productivity						
b. Predictors: (Constant), Privacy, Recreation Amenities, Environmental Factors, Spatial Factors						

(Source: SPSS Output – Regression Model - ANOVA)

According to the Linear Regression Model Summary table generated by SPSS, R value of the model is 0.539. This indicates that a positive relationship exists between independent variables and the dependent variable. R^2 value of 0.291 shows that 29.1% of the variability of *Employee Productivity* can be explained by the independent variables in the model. This also indicates there could be some other factors affecting the dependent variable besides the independent variables defined in the conceptual framework.

The F-ratio in ANOVA table tests whether the overall regression model is a good fit for the data. As shown in Table 4.19, F test is highly significant. Hence, it can be

assumed that independent variables statistically significantly predict the dependent variable.

Table 4.20: Regression Model - Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.778	.157		11.361	.000
	Spatial Factors	.170	.057	.208	3.011	.003
	Environmental Workplace Factors	.175	.056	.203	3.118	.002
	Recreation Amenities	.114	.033	.194	3.493	.001
	Privacy	.035	.041	.051	.855	.393

(Source: SPSS Output – Regression Model - Coefficients)

According to Coefficients table generated by SPSS, *Spatial Factors, Environmental Workplace Factors* and *Recreation Amenities* are statistically significant at the significance level 0.05. The coefficient of *Privacy* is not statistically significantly different from 0 as its p value (0.393) is greater than 0.05. Hence, only $H2_A$, $H3_A$ and $H5_A$ hypothesis are substantiated. $H4_A$ hypothesis is rejected.

The regression coefficient value shows the change in productivity when a variable value is changed by one unit, whilst all other variables are kept constant (Hameed and Amjad, 2009). When the standardized coefficients are compared, it can be concluded that *Spatial Factors* has the highest impact on *Employee Productivity*, followed by *Environmental Workplace Factors*, *Recreation Amenities* and *Privacy*. The regression equation can be given as follows.

EP = 1.778 + 0.170SF + 0.175EF + 0.035P + 0.114RA

Where EP= Employee Productivity, SF= Spatial Factors, EF= Environmental Workplace Factors, P= Privacy RA= Recreation Amenities

Table 4.21 shows the acceptancy status of hypotheses.

Table 4.21: Hypothesis acceptancy status (H2A to H5A)

Hypothesis	Acceptancy Status
H2$_A$: Spatial Factors have a significant impact on productivity of software professionals	**Accepted**
H3$_A$: Environmental Workplace Factors have a significant impact on productivity of software professionals	**Accepted**
H4$_A$: Privacy has a significant impact on productivity of software professionals	Rejected
H5$_A$: Recreation Amenities have a significant impact on productivity of software professionals	**Accepted**

Assumptions of Multiple Regression

It is important to test whether assumptions of multiple regression are met as not meeting the assumptions could lead to untrustworthy results and Type I and Type II error or over- or under- estimation of significance (Osborne and Waters, 2002).

Regression assumes that variables have normal distributions (Osborne and Waters, 2002). Normal P-P plot was used test the normality. As shown in Figure 4.12, residuals of the regression follow the normality line. Hence, it can be concluded that residuals are normally distributed.
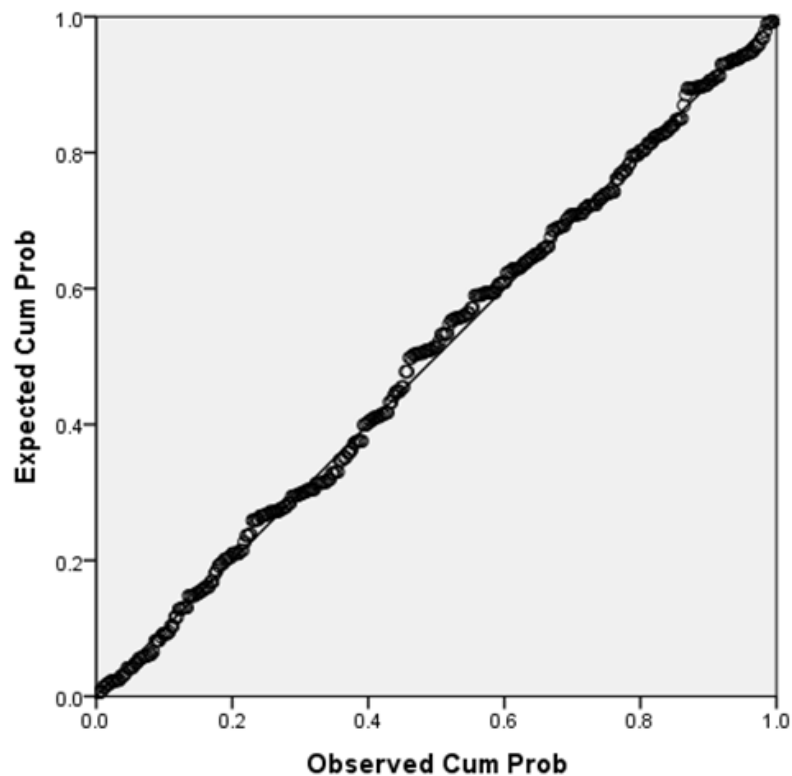
Figure 4.12: Normal P-P plot of regression model

(Source: SPSS Output – Regression – Normal P-P Plot)

Homoscedasticity means whether these residuals are equally distributed or whether they differ at different values of the IV (Osborne and Waters, 2002). This assumption was tested using the scatterplot of distribution of standardized residuals generated by SPSS. As shown in Figure 4.13, residuals are randomly scattered around 0 showing a relatively even distribution. This confirms that the data is homoscedastic.
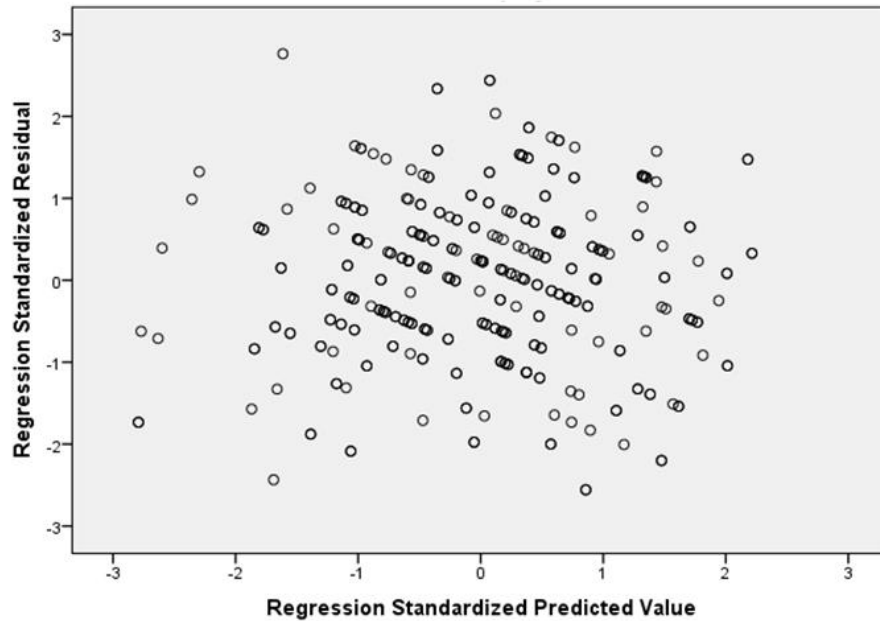
Figure 4.13: Scatterplot of the residuals

(Source: SPSS Output – Scatterplot of the residuals)

Finally, Variance Inflation Factor (VIF) was used to verify the absence of multicollinearity. Multicollinearity can be defined as a statistical phenomenon which occurs when a predictor variable is highly correlated with other predictor variables in a regression model. When a variable with high multicollinearity exists, it indicates that the corresponding variables can be explained by other variables in the analysis. Hence, the model should have little or no multicollinearity.

As shown in Table 4.22, VIF value of all variables are below 10. Hence. It can be concluded that there is no multicollinearity in the model.

Table 4.22: Results of multicollinearity detection

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	Spatial Factors	.443	2.258
	Environmental Workplace Factors	.495	2.021
	Recreation Amenities	.682	1.466
	Privacy	.596	1.678

(Source – SPSS Output – Regression Mode – VIF)

4.2.7. Moderator Effect

Hypothesis 6-9 attempt to determine whether the relationship between workplace design factors and employee productivity in software industry is influenced by the moderator variable *Organizational Culture*. The moderator effect on each independent variable to dependent variable was tested using a SPSS macro plugin developed by Hayes (2017). Figure 4.14 to Figure 4.17 show the SPSS output on moderator effect analysis for each independent variable.

Moderator effect will be significant when zero (0.000) is not in between the lower level confidence interval (LLCI) and upper level confidence interval (ULCI) against Int_1 row of the table (Tewari, 2016). The significance of the moderator is also explained by the p value at 0.05 significance level.

Moderator analysis on *Spatial Factors* and *Employee Productivity* is shown in Figure 4.14. LLCI value is -0.1177 and ULCI value is 0.0290. Zero lies in between the confidence levels. Since the P value (0.2348) is greater than 0.05, the moderator effect is not significant. Hence, the moderator effect of *Organizational Culture* on the relationship between *Spatial Factors* and *Employee Productivity* is not significant, which results in hypothesis $H6_A$ being rejected.

```
Model Summary
          R          R-sq         MSE           F          df1          df2            p
       .5424        .2942        .2824      46.9588       3.0000     338.0000        .0000

Model
              coeff          se           t           p          LLCI         ULCI
constant     1.3688        .4604      2.9729        .0032        .4631       2.2745
SF            .3429        .1311      2.6167        .0093        .0851        .6007
OC            .4105        .1474      2.7839        .0057        .1204        .7005
Int_1       -.0444        .0373     -1.1901        .2348       -.1177        .0290

Product terms key:
 Int_1    :          SF     x     OC

Test(s) of highest order unconditional interaction(s):
      R2-chng          F           df1          df2              p
X*W       .0030      1.4164      1.0000      338.0000        .2348
----------
   Focal predict: SF    (X)
         Mod var: OC    (W)
```

Figure 4.14: Moderator effect on Spatial Factors and Employee Productivity

(Source – SPSS Output – Moderator effect analysis for Spatial Factors)

Figure 4.15 shows the moderator analysis on *Environmental Workplace Factors* and *Employee Productivity*. LLCI value is -0.1477 and ULCI value is 0.0034. Zero lies in between the confidence levels. Since the P value (0.0613) is greater than 0.05, the moderator effect is not significant. Hence, the moderator effect of *Organizational Culture* on the relationship between *Environmental Workplace Factors* and *Employee Productivity* is not significant. Hence, the hypothesis $H7_A$ is rejected.

```
Model Summary
          R          R-sq         MSE           F          df1          df2            p
       .5602        .3139        .2746      51.5359       3.0000     338.0000        .0000

Model
              coeff          se           t           p          LLCI         ULCI
constant      .9429        .4665      2.0214        .0440        .0254       1.8605
EF            .4588        .1358      3.3781        .0008        .1916        .7259
OC            .5228        .1420      3.6826        .0003        .2436        .8021
Int_1       -.0722        .0384     -1.8774        .0613       -.1477        .0034

Product terms key:
 Int_1    :          EF     x     OC

Test(s) of highest order unconditional interaction(s):
      R2-chng          F           df1          df2              p
X*W       .0072      3.5246      1.0000      338.0000        .0613
----------
   Focal predict: EF    (X)
         Mod var: OC    (W)
```

Figure 4.15: Moderator effect on Environmental Workplace Factors and Employee Productivity

(Source – SPSS Output – Moderator effect for Environmental Workplace Factors)

Moderator analysis on *Privacy* and *Employee Productivity* is shown in Figure 4.16. LLCI and ULCI values are -0.0415 and 0.0933 respectively. Zero lies in between the confidence levels. Since the P value (0.4502) is greater than 0.05, the moderator effect is not significant. Hence, the moderator effect of *Organizational Culture* on the relationship between *Privacy* and *Employee Productivity* is not significant, which results in hypothesis H8$_A$ being rejected.

```
Model
              coeff         se          t          p         LLCI       ULCI
constant     2.4335      .3858      6.3079      .0000      1.6747     3.1924
Priv         -.0304      .1310      -.2319      .8167      -.2880      .2272
OC            .2422      .1128      2.1469      .0325       .0203      .4640
Int_1         .0259      .0343       .7559      .4502      -.0415      .0933

Product terms key:
 Int_1    :         Priv x     OC

Test(s) of highest order unconditional interaction(s):
      R2-chng          F        df1        df2           p
X*W      .0012        .5714    1.0000    338.0000       .4502
----------
    Focal predict: Priv (X)
         Mod var: OC    (W)
```

Figure 4.16: Moderator effect on Privacy and Employee Productivity

(Source – SPSS Output – Moderator effect analysis for Privacy)

Figure 4.17 shows the moderator analysis on *Recreation Amenities* and *Employee Productivity*. LLCI and ULCI values are 0.0133 and 0.1330 respectively. Zero does not lie in between the confidence levels. P value (0.0168) is less than 0.05, which means the moderator effect is significant. Hence, the moderator effect of *Organizational Culture* on the relationship between *Recreation Amenities* and *Employee Productivity* is significant. Therefore, hypothesis H9$_A$ is substantiated.

```
Model
              coeff        se         t         p        LLCI       ULCI
constant     2.9044     .3051    9.5191     .0000     2.3043     3.5046
RA           -.2023     .1182   -1.7117     .0879    -.4348      .0302
OC            .1085     .0937    1.1575     .2479    -.0758      .2928
Int_1         .0731     .0304    2.4030     .0168     .0133      .1330

Product terms key:
 Int_1    :        RA    x     OC

Test(s) of highest order unconditional interaction(s):
      R2-chng         F        df1         df2           p
X*W      .0123    5.7743    1.0000    338.0000       .0168
----------
    Focal predict: RA    (X)
          Mod var: OC    (W)
```

Figure 4.17: Moderator effect on Recreation Amenities and Employee Productivity
(SPSS Output – Moderator effect analysis for Recreation Amenities)

Based on the moderator analysis performed, the acceptancy status of hypotheses can be given as follows.

Table 4.23: Hypothesis acceptancy status (H6A to H9A)

Hypothesis	Acceptancy Status
H6$_A$: The impact of Spatial Factors on software professionals' productivity is influenced by the Organizational Culture	Rejected
H7$_A$: The impact of Environmental Workplace Factors on software professionals' productivity is influenced by the Organizational Culture	Rejected
H8$_A$: The impact of Privacy on software professionals' productivity is influenced by the Organizational Culture	Rejected
H9$_A$: The impact of Recreation Amenities on software professionals' productivity is influenced by the Organizational Culture	**Accepted**

4.2.8. ANOVA Test

Since there are more than two groups for Work Experience in the Current Organization, it was decided to use One- Way ANOVA test to test hypothesis 10.

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Work Experience in the Current Organization has five groups named 'Less than 1 year', '1-3 years', '3-5 years', '5-10 years' and 'More than 10 years'. Table 4.24 shows the results of One-Way ANOVA test conducted using *Work Experience in the Current Organization* and *Employee Productivity*. The significance value is 0.062, which is greater than 0.05. Therefore, the null hypothesis (H10$_0$) is substantiated and the alternative hypothesis (H10$_A$) is rejected. This shows that there is no difference in employee productivity between groups of work experience of employees in the current organization. This shows a relationship does not exist between employee productivity and employee work experience in the current organization.

Table 4.24: One-Way ANOVA – Employee work experience in the current organization

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.543	4	.886	2.267	.062
Within Groups	131.709	337	.391		
Total	135.253	341			

(Source – SPSS Output – ANOVA test summary for employee work experience in current organization)

4.3. Discussion on Results

Assessing the relationship between workplace design and employee productivity in the software industry is the current study's primary goal. Software professionals who work in software companies with 100 more employees in Sri Lanka were selected as the target population of the study as large scale software companies tend to invest more in their workplace design. Hence, focusing on large scale software companies will enable us to arrive at better results and achieve research objectives.

Following the literature review, four independent variables, one moderating variable and one dependent variable were decided to be included in the conceptual framework of the research. Spatial Factors, Environmental Workplace Factors, Privacy and Recreation Amenities were selected as independent variables. Organizational Culture and Employee Productivity were selected as the moderating variable and the dependent variable respectively.

The inter-item correlation of variables was tested using Pearson Correlation Matrix in SPSS, in order to test the consistency reliability of the questions belong to the respective variables.

The results showed that items within each variable positively correlate with each other. The cross order correlation among items within the respective variables were shown to be significant at 0.01. Hence, it can be stated that a strong positive relationship exists among the items within each variable of the study.

Inferential statistics generated by Pearson Correlation Matrix showed that a direct relationship exists between workplace design factors and the employee productivity. All independent variables obtained a significant coefficient value at the significance level 0.01. This reveals that all predictor variables of interest (i.e. Spatial Factors, Environmental Workplace Factors, Privacy and Recreation Amenities) have a significant positive relationship with employee productivity which results in $H1_A$ hypothesis being accepted.

Hypothesis 2-5 intended to identify whether the independent variables have a significant impact on the employee productivity. Since the goal is to identify key workplace design factors affecting the employee productivity, the problem can be considered as a regression task. Multiple linear regression shows how a set of explanatory variables is associated with a dependent variable (Elliot and Tranmer, 2008). Moreover, the conceptual research framework had one dependent variable and more than one independent variable. Hence, it was decided to use multiple linear regression to identify the significance of each independent variable for Employee Productivity.

The Regression Model reported R value of 0.539. This indicates there is a positive relationship between independent variables and the dependent variable. The model obtained R^2 value of 0.291, which shows that 29.1% of the variability of Employee Productivity can be explained by the independent variables in the model. When we compare R^2 values we generally observe in linear regression models, this seems to be quite low. According to (Minitab, 2014a), if the main goal of the research is to determine the statistically significant predictors and the variation in the response

variable as a result of a particular change in the predictors, R^2 is almost totally irrelevant. R^2 value does not affect the way how the relationship between the predictor variables and response variable is interpreted, if the regression model is correctly specified (Minitab, 2014a). However, if the main goal is to produce precise predictions, low R^2 values will be problematic (Minitab, 2014b) as precise predictions need to have less error. A low R^2 value also suggests that, there could be some other factors affecting the response variable besides the independent variables defined in the conceptual framework.

According to Coefficients table generated by SPSS, the regression coefficients for the predictor variables Spatial Factors, Environmental Workplace Factors, Privacy and Recreation Amenities are to 0.170, 0.175, 0.035 and 0.114 respectively. The coefficient value of Environmental Workplace Factors can be interpreted as 0.175 increment in the employee productivity when the environmental workplace condition of the office is changed by one unit whilst all other variables remain unchanged.

Taking the coefficient value of Environmental Workplace Factors into consideration, it can be stated that an increase of 0.175 in employee productivity exists for every unit increase in the environmental workplace conditions, whilst not changing anything about all the other variables. When the standardized coefficients of the variables are compared, it can be concluded that Spatial Factors has the highest impact on Employee Productivity, followed by Environmental Workplace Factors, Recreation Amenities and Privacy.

The results of the regression model also showed that the predictor variables Spatial Factors, Environmental Workplace Factors and Recreation Amenities are statistically significant at the significance level 0.05. The coefficient of Privacy was not statistically significant as its p value (0.393) was greater than 0.05. Hence, only $H2_A$, $H3_A$ and $H5_A$ hypothesis were substantiated. $H4_A$ hypothesis was rejected. This means Spatial Factors, Environmental Workplace Factors and Recreation Amenities have a substantial effect on employee productivity in software organizations. However, Privacy does not have a considerable effect on the productivity of software professionals.

Further, these results verify that research findings of this study are consistent with previous research work. Most of the previous research studies have also found Spatial Factors, Environmental Workplace Factors and Recreation Amenities as significant indicators of the productivity of employees.

Hypothesis 6-9 tried to determine whether the relationship between the predictor variables and Employee Productivity is influenced by the Organizational Culture. The moderator effect of Organizational Culture on each independent variable to dependent variable was tested using a SPSS macro plugin developed by Hayes (2017). According to the results of the test, the moderator effect of Organizational Culture was only significant for the relationship between Recreation Amenities and Employee Productivity, which lead to hypothesis $H6_A$, $H7_A$ and $H8_A$ being rejected and only $H9_A$ being substantiated. Hence, we can say that Organizational Culture can moderate the relationship between Recreation Amenities and Productivity of employees in software companies.

It was hypothesized that there is a relationship between work experience in the current organization and the productivity of employees in the software industry. The hypothesis was tested using One-Way ANOVA test. According to the results, a difference in the employee productivity does not exist between groups of work experience of employees. Hence, it can be concluded that a relationship does not exist between the employee productivity and employee work experience in the current organization. This is also supported by research work such as (Hunter Jr, 2017) etc. which had tried to assess the impact of employee work experience (firm experience, unrelated experience, and prior-related work experience) on their productivity.

5. CONCLUSIONS AND RECOMMENDATIONS

This chapter provides a summary of our contributions, conclusions and recommendations on the analysis of the statistical results obtained, and outlines possible directions for future work.

5.1. Conclusions and Recommendations

The main goal of this research study is to assess the relationship between workplace design and employee productivity in the software industry. The workplace design was measured in different aspects such as Spatial Factors, Environmental Workplace Factors, Privacy and Recreation Amenities. This research also attempted to identify the workplace design factors which highly influence the productivity of employees who work in large scale software companies in Sri Lanka. The research framework conceptualized in Figure 3.1 was the primary source of data analysis. Hypotheses were formulated to analyse the data collected via online survey and discover the relationship between workplace design and employee productivity. Since most of the previous studies in this area had used quantitative method and had been successful in achieving their research objectives, it was decided to follow quantitative research method to collect data and dig into the research problem. Hypotheses were tested using statistical analysis methods such as descriptive statistics, Pearson's Correlation analysis, multiple linear regression, moderator effect analysis and one-way ANOVA test.

Pearson's Correlation was used to determine the relationship between the workplace design and employee productivity. According to the results, a direct relationship exists between workplace design factors and the productivity of software professionals. All independent variables obtained a significant coefficient value at the significance level of 0.01. This shows that when the workplace factors are in poor conditions or do not fulfil the needs of the employees, employee productivity will be affected.

Multiple linear regression was used to measure the effect of each predictor variable on employee productivity. Regression model showed that 29.1% of the variability of Employee Productivity can be explained by the independent variables in the model. This suggests that there could be some other factors affecting the employee productivity besides the factors defined in the conceptual framework of this study.

Since this study was restricted to spatial and static aspects of the workplace, we can conclude that the dynamic aspects of the workplace such as resource provisions, infrastructure management etc. could contribute to the remaining 70.9% of the variability of employee productivity in the model.

When the standardized coefficients of the variables in the regression model are taken into account, Spatial Factors seemed to have the highest impact on Employee Productivity, followed by Environmental Workplace Factors, Recreation Amenities and Privacy.

According to the regression coefficients of the model, Spatial Factors, Environmental Workplace Factors and Recreation Amenities seem to be having a significant impact on Employee Productivity. Hence, it can be concluded that not having above factors in a workplace will reduce the employee productivity of software professionals and eventually it will affect the operational and financial performance of the organization.

As per the regression coefficients in Table 4.20, Spatial Factors has the highest impact on the productivity of software professionals. Spatial Factors included the aspects of ergonomic furniture and equipment and spatial arrangement. Hence, it is important that the furniture in the workplace is flexible, adjustable and comfortable enough, otherwise it could lead to reduced employee productivity and various health problems.

Since the regression model summary given in Table 4.20 shows that ergonomic furniture and equipment have a significant impact on the employee productivity, employers should also be concerned about the ergonomics during the workplace design to ensure employees' comfort and satisfaction. According to Saha (2016), if ergonomic principles are ignored during the workplace design, the employee productivity will be reduced and the medical cost for both employee and employer will be increased. Since software professionals heavily use computers, it is important to provide them with large and adjustable monitors, key board trays, footrests, ergonomic keyboards, and wrist support devices etc. and allow for natural and comfortable movements/placements and thereby reducing or eliminating strain in eyes, wrist, neck and shoulders. According to WorkSafeBC (2001), the general rule of thumb is the top line of text on the computer screen should be at eye level. Further, a distance of arm's

length should be there between the user's eyes and the screen (WorkSafeBC, 2001). The keyboard should be at the proper height, so that the user will be able to keep his/her wrists straight while keyboarding (WorkSafeBC, 2001). Similar to the keyboard, the mouse or other pointing devices should also be placed at the proper height to enable users to keep their wrists straight, shoulders relaxed, and elbows by their side while using it (WorkSafeBC, 2001).

Since spatial arrangement was found to be contributing to the employee productivity as per the regression coefficients in Table 4.20, we can say that spatial arrangement plays an important role in improving employee productivity. Hence, it is important that the workspace is designed in a way that it is flexible and gives sufficient space for employees for their movements, normal storage and to perform all their tasks.

The current study included the dimensions of noise, temperature, lighting and ventilation for the variable Environmental Workplace Factors. The regression model summary shown in Table 4.20 shows that Environmental Workplace Factors are statistically significant at the significance level 0.05, which means it has a substantial effect on the productivity of software professionals. Software profession is a job which requires closed detailed work and software professionals mostly work on computers all the day. According to Saha (2016), poor lighting or glare can create eyestrain and hinder the productivity. Hence, it is suggested to have proper and adequate artificial and natural lighting, suitable and controlled temperature and ventilation to improve the office design for better employee productivity.

The questionnaire in Appendix A consists of a question on respondent's preference on open office floor plans. The responses showed that most of the respondents preferred open office plans as opposed to closed offices since it enhances the flexibility and better communication with workers. As the bad side of open office plans, the respondents highlighted the amount of noise and distraction which could draw the employees away from their work. Therefore, employers will need to find more innovative ways to keep their employees focused on their work. According to Gutnick (2007), it can be suggested to have buildings and materials treated for noise transmission and acoustical control. The designated 'quiet rooms' can also be provided

so that employees can use them when they need a quiet space or privacy (Gutnick, 2007).

According to the regression model shown in Table 4.20, Privacy does not seem to have a statistically significant impact on the employee productivity. However, according to Table 4.17, Privacy and Employee Productivity significantly positively correlate with each other. Hence, it can be stated that it is vital that employers are concerned about addressing the need for visual and acoustical privacy, where employees can perform their tasks with appropriate level of focus and concentration.

As per the regression model in Table 4.20, Recreation Amenities have a significant impact on the Employee Productivity. Therefore, it is important that employers offer adequate recreation amenities as not having adequate recreation amenities can affect the employee productivity.

Employers can provide several relaxation rooms or lounge areas with comfortable furniture for employees to rest from work or use as an alternative workplace when they need to change their work environment. The benchmark for this approach was developed by "Google" with its famous play-rooms and "all-included" offices (Lindell, 2010). These facilities will enable employees to relax, manage their stress and ultimately be more productive.

Alker, Malanca, Pottage, and O'Brien (2014) recommend sports and healthcare facilities as primary amenities in a work environment as those will help employees maintain better health, which will eventually reduce medical leaves taken by employees and improve employees' productivity.

According to Figure 4.17, the moderator effect of Organizational Culture is significant for the relationship between Recreation Amenities and Employee Productivity, which concludes that Organizational Culture influences the relationship between Recreation Amenities and Employee Productivity. Hence, employers should ensure the recreation amenities offered by the organization are aligned with organizational culture, business goals, strategic plans of the company and technological changes. The management can get the employees involved in decision making on their workplace design. This will

enable managers to ensure pain points of their employees are addressed through their workplace designs.

It is important that employees are provided with adequate and periodic trainings on workplace ergonomics to educate them about the use of ergonomics. It is also recommended to periodically monitor the usage rate of space, furniture and equipment etc. to determine how the workplace factors are affecting employee productivity and make the workplace design more supportive to the employee productivity. Above factors will enable organizations to continuously improve the workplace design and thereby improving the productivity of their employees.

The workplace design is barely considered as an important factor by most of the organizations in the current business context (Hameed and Amjad, 2009). This study emphasises the importance of the workplace design in increasing the employee productivity. By providing a better workplace, organizations can enjoy direct benefits such as the ability to maintain employee morale, recruit and retain well-qualified employees, increase employee performance, productivity and job satisfaction, maintain wellbeing and health of employees and ultimately reduce its healthcare cost and improve company's profits. Hence, managers can use a good workplace as a valuable tool for the improvement of their employee productivity.

5.2. Limitations of the Study

The primary goal of this study is to identify the association between the workplace design and employee productivity in the software industry. Due to resource limitations, the current study only considered the spatial and static factors of the workplace such as Spatial Factors, Environmental Workplace Factors, Privacy and Recreation Amenities. These factors were selected based on the importance given in previous research work which were carried out in the area of this study. The study did not consider the dynamic aspects of the workplace design which can affect the productivity of software professionals.

This research study discusses how important the human resource management is for the improvement of employee productivity through the physical workplace

environment. However, the emotional and psychological factors which can affect the co-relation between workplace design and employee productivity were not taken into account.

The data was collected through a structured questionnaire only. The current research was restricted only to the setting of Sri Lanka.

5.3. Future Work

The current study only considered spatial and static aspects of the workplace, including Spatial Factors, Environmental Workplace Factors, Privacy and Recreation Amenities. Exploring the effect of the dynamic workplace factors such as resource provisions, technology and infrastructure management etc. on the productivity of software professionals would be an interesting extension to current study.

Studies such as (Jones, Latreille, and Sloane, 2011) etc. have showed that work related psychological conditions of employees have an impact on workplace performance. Hence, the impact of workplace related psychological and emotional factors such as colour, facing to walls at the workplace, working at mini workplaces which are isolated and do not have interactions with other people etc. on the employee productivity can be investigated.

The data was collected through a structured questionnaire. Future studies can explore other methods such as interviews etc. to collect data. The research can involve a multidisciplinary approach involving inputs or feedback from interior designers, psychologists, and experts in personnel management to achieve better results, findings and insights.

Another interesting extension of this study would be the investigation of demographic differences such as gender, age education etc. towards the relationship between workplace design and employee productivity.

The current study was limited to the Sri Lankan context. Hence, it can be extended to other countries to explore the impact of cultural differences across the world on the correlation between workplace design and employee productivity.

5.4. Concluding Remarks

The research problem of this study was;

What is the relationship between workplace design and employee productivity in the software industry?

In order to answer this research problem, three research objectives were initiated:

- *To analyse the co-relation between the workplace design and employee productivity in software industry*

The conceptual research framework was formulated after a comprehensive analysis of previous research work carried out in the area of workplace design and employee productivity. The results of the present study showed the workplace design factors have a significant correlation with the employee productivity. Therefore, the present study has successfully achieved this research objective.

- *To identify the key factors of workplace design affecting the employee productivity*

Based on the data analysis and the results obtained, it was found that Spatial Factors, Environmental Workplace Factors and Recreation Amenities have a significant effect on the employee productivity. The results also revealed that the relationship between Recreation Amenities and Employee Productivity is influenced by the Organizational Culture. Aforementioned facts show that the present study has accomplished this research objective.

- *To provide recommendations to improve the workplace design for better employee productivity*

The recommendations were given based on the research findings, to improve the workplace design of software companies. These recommendations will help employers and the management of software companies to identify the areas of their workplace design to be improved and thereby improving the employee productivity and enjoying other benefits associated with it. Therefore, it can be stated that the present study has successfully achieved the above research objective.

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APPENDIX A – QUESTIONNAIRE INSTRUMENT

Dear Sir/Madam,

This survey is conducted as a partial fulfilment of my MBA in Information Technology at the Department of Computer Science & Engineering, University of Moratuwa. The objective of this study is to analyze the impact of workplace design on employee productivity in the software industry.

I will be grateful, if you could extend your kind cooperation by taking 10 - 15 minutes from your valuable time to fill this questionnaire.

https://docs.google.com/forms/d/e/1FAIpQLSfllpVKuTWj5oBR2UwgjE7iq31VNeb hR9j0Z0S5PE5mH0s31A/viewform?usp=sf_link

Please note that the information provided by you will be kept confidential and used for academic purposes only.

Thank you for your time and support in making this study possible.

Ishani Liyanage

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Workplace Design and Its Impact on Employee Productivity in Software Industry

To what extent do you agree or disagree with each of the following statements on your current workplace?

No	Question	Strongly Agree	Agree	Partially Agree	Disagree	Strongly Disagree
Spatial Factors						
1	My furniture is comfortable enough so that I can work without getting tired till I leave from office.					
2	My furniture is flexible to adjust, rearrange or reorganize my workspace. E.g. Adjustable chairs, sit-to-stand desks, adjustable monitors, key board trays etc.					
3	My keyboard and mouse at my workstation allows for natural and comfortable arm placement and reduces strain in my wrist, neck and shoulders.					
4	My workplace is open enough to see my colleagues working and allows social interaction between me and other workers					
5	I am comfortable with the space provided and my work area is sufficiently equipped for my typical needs (movements, normal storage, perform all tasks, informal and instant meetings etc.).					
6	My workplace is sufficiently equipped with different types of work spaces for activities such as complex assignments, informal and formal meetings, social team projects, private meetings etc.					
Environmental Workplace Factors						

7	My work environment is quiet enough for productive work and does not affect my communication with others					
8	The overall temperature of my workspace is conducive enough for productive work					
9	My workspace is provided with efficient lighting so that I can work easily without strain on my eyes					
10	Ample amount of natural light comes into my office through the number of windows in my work area					
11	My workplace has proper ventilation systems which clean and provide adequate level of air humidity to give a feeling of freshness without causing stagnation of the indoor air					
Privacy						
12	My workspace provides visual privacy (E.g. I can concentrate on my work without being visually distracted)					
13	My workspace provides acoustical privacy (E.g. People can talk in privacy according to the level of confidentiality required, Noises and conversations do not interfere with my concentration, Noises or conversations do not make it difficult to hear or understand speech when my work involves using the telephone)					
14	I have enough privacy in my workspace					
15	I prefer having a closed office for my privacy					
Recreation Amenities						
16	My workplace promotes indoor recreational facilities (through recreational facilities onsite, company sponsored memberships etc.) that					

	employees can use for physical activity and games, such as gym, room for yoga/Zumba classes, shower/change room facilities, table tennis, video games, foosball, indoor basketball court etc.				
17	My workplace has outdoor facilities employees can use for physical activity such as parks, walking areas, swimming pool, basketball hoop				
18	My workplace has coffee bars, cafeterias or is very conveniently located with many restaurants to provide access to many food options and accommodate work- casual communication and collaboration				
19	My workplace provides relaxation areas to disconnect from our work for few moments and relax, such as breakout zones, libraries, game rooms, nap room, coffee shop, lounge rooms, massage chairs facilities, sleeping bunks and bean bags etc.				
20	My workplace has onsite or near-site healthcare/ clinic facilities to provide convenient and timely access to primary care services.				
Organizational Culture					
21	My organization is open to new technology, and equips employees with tools and technology to encourage mobility and efficient work				
22	Trainings are provided as needed to educate employees about ergonomics and workplace safety and to ensure employees are using furniture, technology and equipment properly				

23	My organization encourages and helps maintain a collaborative and friendly work environment					
24	My organization has policies and processes to maintain a better workplace and efficiency and wellbeing of employees (e.g. policies and processes to reserve quite space and collaboration space; incentives to encourage movement both in the work environment and outside of the typical workday; maintenance and regular checks on heating, ventilation, air conditioning and other office equipment etc.)					
25	My organization adapts strategic view on workplace to boost productivity and wellbeing of employees (e.g. monitoring usage rate of space, furniture and equipment; analyse the feedback from employees on workplace on a regular basis; implements changes an ongoing basis etc.)					
Employee Productivity						
26	For the past three months, the number of tasks I performed in a day has been increasing.					
27	I am able to complete my tasks within the set deadlines					
28	In past three months, I was hardly absent due to being sick					
29	Number of hours I work each week is higher than a usual working week					
30	I am able to generate more than an hour's worth of productivity of each hour					

31	**Do you think a good workplace design will make a positive impact on your productivity?**	Yes	No

32	**Briefly explain the workplace design of your current organization and how it helps you to improve your productivity**		
33	**Any recommendations or suggestions to improve your workplace design?**		
34	**Gender**	Male	Female
35	**What is your age group?**		
	Less than 25 years		
	26-35 years		
	36-45 years		
	46-55 years		
	56 years and above		
36	**Which of the following categories best describes the software industry you work in?**		
	Software Company - Products		
	Software Company - Services		
	Software Company - Others		
37	**What is the size of your organization (in terms of no. of employees)?**		
	Less than 100 employees		
	100 – 250 employees		
	251 – 1000 employees		
	1001 – 2500 employees		
	More than 2500 employees		
38	**Which of the following best describes your job title?**		
	Business Analyst		
	Software Engineer		
	Quality Assurance Engineer		
	Technical Writer		
	Project Manager		
	System Engineer		
	Help Desk Officer		
	Lead/ Manager		
	Other		
39	**How long have you been working for your current organization?**		
	Less than 1 year		
	1-3 years		
	3-5 years		
	5-10 years		
	More than 10 years		

APPENDIX B - DESCRIPTIVE STATISTICS

Table B.1: Gender Distribution

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	114	33.3	33.3	33.3
	Male	228	66.7	66.7	100.0
	Total	342	100.0	100.0	

Table B.2: Age Group Distribution

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	26-35 years	285	83.3	83.3	83.3
	36-45 years	44	12.9	12.9	96.2
	Less than 25 years	13	3.8	3.8	100.0
	Total	342	100.0	100.0	

Table B.3: Software Industry Category Distribution

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Software Company - Other	13	3.8	3.8	3.8
	Software Company - Product	232	67.8	67.8	71.6
	Software Company - Services	97	28.4	28.4	100.0
	Total	342	100.0	100.0	

Table B.4: Job Role Distribution

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Business Analyst	37	10.8	10.8	10.8
	Consultant	20	5.8	5.8	16.7
	Help Desk Officer	6	1.8	1.8	18.4
	Intern	3	.9	.9	19.3
	Lead/Manager	42	12.3	12.3	31.6
	Other	24	7.0	7.0	38.6
	Project Manager	7	2.0	2.0	40.6
	Quality Assurance Engineer	53	15.5	15.5	56.1
	Software Engineer	137	40.1	40.1	96.2
	Systems Engineer	13	3.8	3.8	100.0
	Total	342	100.0	100.0	

Table B.5: Work Experience in the Current Organization Distribution

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-3 years	107	31.3	31.3	31.3
	3-5 years	97	28.4	28.4	59.6
	5-10 years	71	20.8	20.8	80.4
	Less than 1 year	54	15.8	15.8	96.2
	More than 10 years	13	3.8	3.8	100.0
	Total	342	100.0	100.0	

Table B.6: Organization Size (No of Employees) Distribution

		Frequency	Percent	Valid Percent	Cumulative Percent
	100 – 250 employees	151	44.2	44.2	44.2
	1001 – 2500 employees	22	6.4	6.4	50.6
Valid	251 – 1000 employees	106	31.0	31.0	81.6
	More than 2500 employees	63	18.4	18.4	100.0
	Total	342	100.0	100.0	

Table B.7: Statistics: Spatial Factors – Item No. 1

Question 1: My furniture is comfortable enough so that I can work without getting tired till I leave from office					
		Frequency	Percent	Valid Percent	Cumulative Percent
	I Strongly Disagree	5	1.5	1.5	1.5
	I Disagree	34	9.9	9.9	11.4
Valid	I Partially Agree	70	20.5	20.5	31.9
	I Agree	150	43.9	43.9	75.7
	I Strongly Agree	83	24.3	24.3	100.0
	Total	342	100.0	100.0	

Table B.8: Statistics: Spatial Factors – Item No. 2

		Frequency	Percent	Valid Percent	Cumulative Percent
Question 2 : My furniture is flexible to adjust, rearrange or reorganize my workspace					
Valid	I Strongly Disagree	15	4.4	4.4	4.4
	I Disagree	34	9.9	9.9	14.3
	I Partially Agree	93	27.2	27.2	41.5
	I Agree	122	35.7	35.7	77.2
	I Strongly Agree	78	22.8	22.8	100.0
	Total	342	100.0	100.0	

Table B.9: Statistics: Spatial Factors – Item No. 3

		Frequency	Percent	Valid Percent	Cumulative Percent
Question 3: My keyboard and mouse at my workstation allow for natural and comfortable arm placement					
Valid	I Strongly Disagree	6	1.8	1.8	1.8
	I Disagree	51	14.9	14.9	16.7
	I Partially Agree	78	22.8	22.8	39.5
	I Agree	150	43.9	43.9	83.3
	I Strongly Agree	57	16.7	16.7	100.0
	Total	342	100.0	100.0	

Table B.10: Statistics: Spatial Factors – Item No. 4

Question 4: My workplace is open enough to see my colleagues working and allows social interaction between me and other workers					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	4	1.2	1.2	1.2
	I Disagree	22	6.4	6.4	7.6
	I Partially Agree	55	16.1	16.1	23.7
	I Agree	150	43.9	43.9	67.5
	I Strongly Agree	111	32.5	32.5	100.0
	Total	342	100.0	100.0	

Table B.11: Statistics: Spatial Factors – Item No. 5

Question 5: I am comfortable with the space provided and my work area is sufficiently equipped for my typical needs					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	13	3.8	3.8	3.8
	I Disagree	37	10.8	10.8	14.6
	I Partially Agree	60	17.5	17.5	32.2
	I Agree	146	42.7	42.7	74.9
	I Strongly Agree	86	25.1	25.1	100.0
	Total	342	100.0	100.0	

Table B.12: Statistics: Spatial Factors – Item No. 6

Question 6: My workplace is sufficiently equipped with different types of work spaces for activities

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	13	3.8	3.8	3.8
	I Disagree	39	11.4	11.4	15.2
	I Partially Agree	99	28.9	28.9	44.2
	I Agree	118	34.5	34.5	78.7
	I Strongly Agree	73	21.3	21.3	100.0
	Total	342	100.0	100.0	

Table B.13: Statistics: Environmental Workplace Factors – Item No. 7

Question 7: My work environment is quiet enough for productive work and does not affect my communication with others

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	13	3.8	3.8	3.8
	I Disagree	68	19.9	19.9	23.7
	I Partially Agree	67	19.6	19.6	43.3
	I Agree	159	46.5	46.5	89.8
	I Strongly Agree	35	10.2	10.2	100.0
	Total	342	100.0	100.0	

Table B.14: Statistics: Environmental Workplace Factors – Item No. 8

Question 8: The overall temperature of my workspace is conducive enough for productive work					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	10	2.9	2.9	2.9
	I Disagree	30	8.8	8.8	11.7
	I Partially Agree	97	28.4	28.4	40.1
	I Agree	149	43.6	43.6	83.6
	I Strongly Agree	56	16.4	16.4	100.0
	Total	342	100.0	100.0	

Table B.15: Statistics: Environmental Workplace Factors – Item No. 9

Question 9: My workspace is provided with efficient lighting so that I can work easily without strain on my eyes					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	8	2.3	2.3	2.3
	I Disagree	11	3.2	3.2	5.6
	I Partially Agree	42	12.3	12.3	17.8
	I Agree	186	54.4	54.4	72.2
	I Strongly Agree	95	27.8	27.8	100.0
	Total	342	100.0	100.0	

Table B.16: Statistics: Environmental Workplace Factors – Item No. 10

Question 10: Ample amount of natural light comes into my office through the number of windows in my work area		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	28	8.2	8.2	8.2
	I Disagree	56	16.4	16.4	24.6
	I Partially Agree	88	25.7	25.7	50.3
	I Agree	119	34.8	34.8	85.1
	I Strongly Agree	51	14.9	14.9	100.0
	Total	342	100.0	100.0	

Table B.17: Statistics: Environmental Workplace Factors – Item No. 11

Question 11: My workplace has proper ventilation systems which clean and provide adequate level of air humidity		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	17	5.0	5.0	5.0
	I Disagree	45	13.2	13.2	18.1
	I Partially Agree	96	28.1	28.1	46.2
	I Agree	121	35.4	35.4	81.6
	I Strongly Agree	63	18.4	18.4	100.0
	Total	342	100.0	100.0	

Table B.18: Statistics: Privacy – Item No. 12

Question 12: My workspace provides visual privacy		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	12	3.5	3.5	3.5
	I Disagree	89	26.0	26.0	29.5
	I Partially Agree	105	30.7	30.7	60.2
	I Agree	103	30.1	30.1	90.4
	I Strongly Agree	33	9.6	9.6	100.0
	Total	342	100.0	100.0	

Table B.19: Statistics: Privacy – Item No. 13

Question 13: My workspace provides acoustical privacy		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	16	4.7	4.7	4.7
	I Disagree	80	23.4	23.4	28.1
	I Partially Agree	117	34.2	34.2	62.3
	I Agree	91	26.6	26.6	88.9
	I Strongly Agree	38	11.1	11.1	100.0
	Total	342	100.0	100.0	

Table B.20: Statistics: Privacy – Item No. 14

Question 14: I have enough privacy in my workspace		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	11	3.2	3.2	3.2
	I Disagree	71	20.8	20.8	24.0
	I Partially Agree	118	34.5	34.5	58.5
	I Agree	105	30.7	30.7	89.2
	I Strongly Agree	37	10.8	10.8	100.0
	Total	342	100.0	100.0	

Table B.21: Statistics: Privacy – Item No. 15

Question 15: I prefer having a closed office for my privacy		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	29	8.5	8.5	8.5
	I Disagree	90	26.3	26.3	34.8
	I Partially Agree	106	31.0	31.0	65.8
	I Agree	89	26.0	26.0	91.8
	I Strongly Agree	28	8.2	8.2	100.0
	Total	342	100.0	100.0	

Table B.22: Statistics: Recreation Amenities – Item No. 16

Question 16: My workplace promotes indoor recreational facilities					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	78	22.8	22.8	22.8
	I Disagree	72	21.1	21.1	43.9
	I Partially Agree	56	16.4	16.4	60.2
	I Agree	82	24.0	24.0	84.2
	I Strongly Agree	54	15.8	15.8	100.0
	Total	342	100.0	100.0	

Table B.23: Statistics: Recreation Amenities – Item No. 17

Question 17: My workplace has outdoor facilities employees can use for physical activity					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	106	31.0	31.0	31.0
	I Disagree	85	24.9	24.9	55.8
	I Partially Agree	53	15.5	15.5	71.3
	I Agree	61	17.8	17.8	89.2
	I Strongly Agree	37	10.8	10.8	100.0
	Total	342	100.0	100.0	

Table B.24: Statistics: Recreation Amenities – Item No. 18

Question 18: My workplace has coffee bars, cafeterias or is very conveniently located with many restaurants					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	38	11.1	11.1	11.1
	I Disagree	66	19.3	19.3	30.4
	I Partially Agree	83	24.3	24.3	54.7
	I Agree	107	31.3	31.3	86.0
	I Strongly Agree	48	14.0	14.0	100.0
	Total	342	100.0	100.0	

Table B.25: Statistics: Recreation Amenities – Item No. 19

Question 19: My workplace provides relaxation areas to disconnect from our work for few moments and relax					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	76	22.2	22.2	22.2
	I Disagree	97	28.4	28.4	50.6
	I Partially Agree	64	18.7	18.7	69.3
	I Agree	62	18.1	18.1	87.4
	I Strongly Agree	43	12.6	12.6	100.0
	Total	342	100.0	100.0	

Table B.26: Statistics: Recreation Amenities – Item No. 20

		Frequency	Percent	Valid Percent	Cumulative Percent
Question 20: My workplace has onsite or near-site healthcare/ clinic facilities					
Valid	I Strongly Disagree	44	12.9	12.9	12.9
	I Disagree	89	26.0	26.0	38.9
	I Partially Agree	75	21.9	21.9	60.8
	I Agree	93	27.2	27.2	88.0
	I Strongly Agree	41	12.0	12.0	100.0
	Total	342	100.0	100.0	

Table B.27: Statistics: Organizational Culture – Item No. 21

		Frequency	Percent	Valid Percent	Cumulative Percent
Question 21: My organization is open to new technology, and equips employees with tools and technology to encourage mobility and efficient work					
Valid	I Strongly Disagree	14	4.1	4.1	4.1
	I Disagree	26	7.6	7.6	11.7
	I Partially Agree	118	34.5	34.5	46.2
	I Agree	112	32.7	32.7	78.9
	I Strongly Agree	72	21.1	21.1	100.0
	Total	342	100.0	100.0	

Table B.28: Statistics: Organizational Culture – Item No. 22

Question 22: Trainings are provided as needed to educate employees about ergonomics and workplace safety		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	29	8.5	8.5	8.5
	I Disagree	73	21.3	21.3	29.8
	I Partially Agree	90	26.3	26.3	56.1
	I Agree	100	29.2	29.2	85.4
	I Strongly Agree	50	14.6	14.6	100.0
	Total	342	100.0	100.0	

Table B.29: Statistics: Organizational Culture – Item No. 23

Question 23: My organization encourages and helps maintain a collaborative and friendly work environment		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	4	1.2	1.2	1.2
	I Disagree	23	6.7	6.7	7.9
	I Partially Agree	82	24.0	24.0	31.9
	I Agree	157	45.9	45.9	77.8
	I Strongly Agree	76	22.2	22.2	100.0
	Total	342	100.0	100.0	

Table B.30: Statistics: Organizational Culture – Item No. 24

Question 24: My organization has policies and processes to maintain a better workplace and efficiency and wellbeing of employees		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	10	2.9	2.9	2.9
	I Disagree	60	17.5	17.5	20.5
	I Partially Agree	95	27.8	27.8	48.2
	I Agree	117	34.2	34.2	82.5
	I Strongly Agree	60	17.5	17.5	100.0
	Total	342	100.0	100.0	

Table B.31: Statistics: Organizational Culture – Item No. 25

Question 25: My organization adapts strategic view on workplace to boost productivity and wellbeing of employees		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	21	6.1	6.1	6.1
	I Disagree	68	19.9	19.9	26.0
	I Partially Agree	106	31.0	31.0	57.0
	I Agree	105	30.7	30.7	87.7
	I Strongly Agree	42	12.3	12.3	100.0
	Total	342	100.0	100.0	

Table B.32: Statistics: Employee Productivity – Item No. 26

		Frequency	Percent	Valid Percent	Cumulative Percent
Question 26: For the past three months, the number of tasks I performed in a day has been increasing.					
Valid	I Strongly Disagree	3	.9	.9	.9
	I Disagree	36	10.5	10.5	11.4
	I Partially Agree	106	31.0	31.0	42.4
	I Agree	161	47.1	47.1	89.5
	I Strongly Agree	36	10.5	10.5	100.0
	Total	342	100.0	100.0	

Table B.33: Statistics: Employee Productivity – Item No. 27

		Frequency	Percent	Valid Percent	Cumulative Percent
Question 27: I am able to complete my tasks within the set deadlines					
Valid	I Strongly Disagree	8	2.3	2.3	2.3
	I Disagree	23	6.7	6.7	9.1
	I Partially Agree	101	29.5	29.5	38.6
	I Agree	156	45.6	45.6	84.2
	I Strongly Agree	54	15.8	15.8	100.0
	Total	342	100.0	100.0	

Table B.34: Statistics: Employee Productivity – Item No. 28

Question 28: In past three months, I was hardly absent due to being sick					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	36	10.5	10.5	10.5
	I Disagree	65	19.0	19.0	29.5
	I Partially Agree	63	18.4	18.4	48.0
	I Agree	106	31.0	31.0	78.9
	I Strongly Agree	72	21.1	21.1	100.0
	Total	342	100.0	100.0	

Table B.35: Statistics: Employee Productivity – Item No. 29

Question 29: Number of hours I work each week is higher than a usual working week					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I Strongly Disagree	13	3.8	3.8	3.8
	I Disagree	55	16.1	16.1	19.9
	I Partially Agree	103	30.1	30.1	50.0
	I Agree	109	31.9	31.9	81.9
	I Strongly Agree	62	18.1	18.1	100.0
	Total	342	100.0	100.0	

Table B.36: Statistics: Employee Productivity – Item No. 30

		Frequency	Percent	Valid Percent	Cumulative Percent
Question 30: I am able to generate more than an hour's worth of productivity of each hour					
Valid	I Strongly Disagree	6	1.8	1.8	1.8
	I Disagree	35	10.2	10.2	12.0
	I Partially Agree	154	45.0	45.0	57.0
	I Agree	119	34.8	34.8	91.8
	I Strongly Agree	28	8.2	8.2	100.0
	Total	342	100.0	100.0	