IMPACTS OF INTERIOR DESIGN PROJECTS ON PRODUCTIVITY OF EMPLOYEES

Nishani Randika Gankananda

(118429V)

Degree of Master of Science in Project Management

Department of Building Economics

University of Moratuwa

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DECLARATION

I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Dr. E.N.D. De Silva Date
Dissertation Supervisor

ABSTRACT

Impacts of Interior Design Projects on Productivity of Employees

Previous studies have concluded that interior design parameters have an influence on the productivity in office environment. However this fact does not attract sufficient and significant emphasis in Sri Lankan setting. Therefore, this research was focused on exploring the effect of interior design on the productivity of employees in Sri Lankan context and identification of the key interior design parameters responsible for the processes in office environments.

Four major factors including furniture arrangement, colour of walls/partitions, visuals and service distribution were identified as significant factors for employees' productivity, using t-test. Further these factors were studied in detail to identify their impact on employee productivity through five case studies.

The five cases were selected from the commercial capital of Sri Lanka, Colombo, so as to represent varying professional atmospheres. Three of them had recently updated interior according to new concepts whereas other two did not have so. Data collection was carried out through observation of office environments and officers' behaviour, questionnaire survey, interviews and telephone conversations with those who experience the impact of worker productivity. Furthermore, discussions were carried out with the management of the companies chosen for case studies, in order to verify the obtained results and the test results were proven to be accurate according to their observations and experience.

Results reveals proper furniture arrangement ensures efficiency of employees and significantly improves teamwork and speed of work while comfortable furniture encourages continuous working. On the other hand, use of colours improves employees' mood and quality of work. Further, placing visually attractive artefacts, displaying motivational wordings and quotes and establishing windows increase moral, motivation and comfort of employees. According to this study, service distribution within an office space causes convenience in communication within the office and also with the outsiders and increases the service status, while saving time by minimizing movement inside the office and waiting time to use electrical equipment.

This research would be a benchmark study for commercial organizations as a technique for improving their employees' productivity.

Keywords: *Office interior, Productivity, Employees*

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CHAPTER 01

INTRODUCTION

1.1 Background

According to history, Europe, Africa, America and Asia developed interior with architecture separately, while culture and religion caused differentiation of design. An ancient interior designer, craftsman and architect named Vishwakarma in Hinduism is widely known, who designed god's palaces and their weapons, stands as proof that architecture was deeply intertwined with culture and religion. According to archaeological evidence, the first shelter found in Lascaux and Altamira had been used for religious ceremonies or emergencies. Further in history, human beings started developing their homes using available long lasting material and they tried to design their interiors attractively (John, 2005).

In early 5th century, interior designing developed dominantly, to gain most profit, least risk and maximum convenience for owners (Meel, 2000). Gradually people took interest in applying similar interior design concept to their working places. For instance, in 9th century there are evidences that people used desks to do their work and in the 15th century merchants have used workstations. Further, there are evidences that in the 19th century, a number of architects were more concerned about interior design and they worked with cabinetmakers, decorators, domestic engineers and artists to incorporate interior design elements into the buildings they designed. Hence, at the start of the 20th century, interior designing was started to develop as a profession (Meel, 2000). In early times around 1920, architects have worked as "interior architects" who designed both the building and interior. For example, according to Janjenning, Bauhaus-Lily Reich called herself an interior architect during this era (Allison, 2009). The term "interior designer" came into use and decorators established organizations and identified themselves as "interior designers" in 1960s and also communicated the difference between designer and decorator to the public. Interior designers enhanced the function, safety and quality of interior spaces of private homes, public buildings and business or institutional facilities such

as restaurants, homes, offices, public buildings, hospitals and theatres. They also planned the interior of renovations and expansions for existing structures.

There are planning and design criteria for different types of office buildings. However, in early developing stages of interior designing, common human needs within a building, such as daylight, an outside view, privacy and territory may not have been addressed adequately as planned and development of workers' productivity within organizations was a problem. This shortcoming was thus highlighted in office space planning all over Europe, and as a result, offices were designed according to employees' requirements, creating productive office spaces (Meel, 2000).

There were many aspects that were carefully considered when designing productive work spaces and furniture designing played an important role in this regard. During this time, most offices were rented by office owners. Therefore building owners tried to attract company owners to their buildings by developing interior spaces through attractive furniture design. Further, furniture designing and space arrangement developed with standard forms and space planning methods to gain more productivity later in history. After 1980's, noisy machines and computers were introduced to offices and therefore, furniture were designed according to new requirements (Adler, 2003).

Colour was one other main element used by interior designers to decorate spaces. It was the main technique used to develop productivity according to interior design theory. Colour is mainly divided into two segments as warm colours and cool colours, according to its effect on feelings. It also has another division as primary, secondary, tertiary and complex. Every colour has unique qualities which affect people's productivity (David, C, 1993). Influences of interior colour on workers' productivity are dependent upon worker stimulus screening ability and time of exposure (Wiley, 2007 and Lewis, 1990).

Lighting is another prominent requirement that is essential for work and it is a very important element of an interior. Even though daylight is the most suitable light for workers, suitable luminance cannot be solely provided by sunlight when creating office spaces. Instead, designers have to use various lighting systems to provide required lighting levels. Parabolic down lights, ceiling suspended lights and lensed indirect uplight systems are widely used in this case. While observing workers' behaviour under various lighting conditions, it was seen that they need a proper indirect lighting system, since daylight does not direct sufficient ambient lighting for productive work (Hedge et al., 1995).

Interior decor and views play big role in interior. Plants, Models. Art wall, pictures can use as deco. Interior plants course to reduce stress, improve air quality, quieter background noise level (Interiorgardenslv, n.d.). Furthermore in door plant increase reaction in 12% (Virgina, Caroline, Georgio, 1996). Also Window views course to psychological conditions and work performance (Myriam, Jennifer, Newsham, 2010) Meanwhile, new technological advancements interfered with interior designing in 1980's and as a result, office space designing came to be more complex with technological requirements (Kybernets, 1972). It created even more complex office spaces because building owners needed the cheapest and most efficient technology distribution systems that can attract more tenants. On the other hand, tenants needed to gain more profit through developing workers' productivity (Adler, 2003 and Devapriya and Ganesan, 2002). Emergency systems (computers and typewriters were used in emergency systems), artificial lighting and telephone facility distribution are very essential for interior designing because they causes to gain maximum economic benefits (Meel, 2000 and Kybernets, 1972).

According to literature, above factors greatly effect on workers' productivity. However in Sri Lankan context, the impact of interior design projects on employee productivity has not been extensively studied. Therefore, this research focuses on studying the influence of above factors on employee productivity in the Sri Lankan context.

1.2 Problem Statement

Office spaces are designed in various manners and updated to improve their prevailing conditions. The concept of enhancing productivity through interior design has been largely overlooked in the global context unlike in Sri Lankan context, mainly with attention to space planning, while however, other interior design parameters also contribute to employee productivity.

Therefore, this research was carried out to identify the effect of interior design parameters in improving employee productivity in the local context.

1.3 Objectives of the Study

- Identifying different interior planning in office spaces.
- Identifying factors related to interior design to improve productivity.
- Analysis of the impact of such factors on employees' productivity.

1.4 Scope and Limitations of the Study

- The study will be limited to Sri Lankan office spaces.

1.5 Research Methodology

Survey approach was to use questionnaires, semi-structured interviews, key informal interviews and building case studies for employees who work in architecturally designed office spaces. This research is a "qualitative" study through which findings were mainly derived from preference data collected from two sample groups, managers who examine employee behaviour and employees.

Western Province was selected for the study as it is the metropolitan area where most of offices of Sri Lanka is situated according to statistics of companies register board. Also this is a highly urban geographical area in which extensive numbers of office buildings are located in comparison to other provinces. Main focus will be on Colombo District because majority of offices are more complex and have

windowless environments. On the other hand, a number of buildings need modifications because professions have become more technological and complex and most of them are currently being modified. Hence, attention was mainly given to interiors created more efficiently to develop businesses and employee satisfaction in Colombo, Western Province focussing on commercial buildings.

Attention was given to observing the interior design approaches for the development of employee performance and identifying factors related to interior design to improve productivity using Statistical Package for the Social Sciences – SPSS.

1.6 Chapter Break Down

- **Chapter One**

  This chapter describes the background study of conceptual development of interior design elements over decades in different continents. Also, the scope of study, justification of the research scope, limitations of the research and the methods adopted for the research will be described in this chapter.

- **Chapter Two**

  Chapter two includes a literature survey to discover and analyse the earlier efforts to develop productivity using interior decorative and upgrading elements such as colours, lighting, technology, furniture and space planning, assorted accurately with the help of research and record evidence. The research will be evaluated with Sri Lankan office interior elements.

- **Chapter Three**

  This chapter describes research approach, case study design, case selection, case study data collection method, sample selection, and data analysis method.

- **Chapter Four**

  Chapter four concludes the research findings and discussion about fact which positively impact on employees' productivity according to SPSS results

- **Chapter Five**

  Chapter five conclude the results, discuss about limitations and further research possibilities related to this research topic. This chapter conclude the dissertation.

CHAPTER 02

LITERATURE REVIEW

2.1 Introduction

The aim of this study was to review elements related to interior design which are related to productivity of working environment as space arrangement, colour used at the related environment, lighting illuminance and facilities management. Further this chapter has being discussed above element relationship between workers productivity through early researches. This chapter is used to clarify interior related elements from early studies and to identify their involvement with workers' productivity in international context. Furthermore, some researchers describe productivity as an increasing functional and organizational performance including quality (Dorgan, 1994).

2.2 Basic Methods to Achieve Workplace Productivity

Every company owner's expectation is to get the maximum outcome from their workers. Therefore, the company tries to create well organized, low energy and healthy buildings and improve profit (Clements-Croome, 2006). With related to profitability of companies, productivity is defined as workers' quality wise good working capacity for an hour (Sutermeister, 1976).

Wellbeing, ability to perform, motivation, job satisfaction and technical competence have been identified as the factors influence productivity (Clements and Baizhan, 2000). It has been found that uncrowned creative office spaces can gain productivity by 10% (Clements and Baizhan, 2000) It has also been found that fresh air and temperature control, lighting control, daylight and view, including reduced direct solar gain, privacy and working in quiet conditions, network access, multiple data, power and voice connected systems, ergonomic furniture with environmentally sensitive finishes are involved in workers' productivity (Clements-Croome, 2000). Furthermore, there are some aspects related negatively to workers' productivity and

moral, such as poorly designed workstations, unsuitable furniture, lack of ventilation, inappropriate lighting, excessive noise, insufficient safety measures in fire emergencies and lack of personal protective equipment (Chandrasekara, 2011). Additionally, researches have described that workers' productivity is also related with layout of individual workspaces, workplace colour schemes, interior plants, dust levels and biological contaminants which should be considered by the top management of organizations (Abdul, 2011). Also some other researcher proves that furniture, noise, temperature, lighting, spatial arrangement, colour, outside view and presence of plants and flowers, as factors affecting the performance of employees (El-Zeiny, 2011). Other researches also state that, lighting condition causes improvement of productivity (Ajala, 2012) and it is the quality of the employee's workplace environment that most impacts on their level of motivation and subsequent performance (Chandrasekara, 2011).

2.2.1 Effect of indoor space arrangement on employee productivity

Space can be expressed as the main element of interior design. It gives a considerable support to develop productivity in many ways. On the other hand, unsatisfactory space arrangement causes job stress through unhappiness about their working environment (Clemen-crome, 2000). Spaces consist of three dimensional planes as floor, walls and ceiling (Chin and Binggeli, 2012).

Due to the involvement of new technology, trendy interior design is being used as a productivity development method. Space arrangement of new technological equipment and facilities and managing the space, get more importance in the development of workers' productivity. A technically and aesthetically well-arranged space plan, directly and indirectly influences workers' behaviour, well-being and self-access productivity. Proper space planning also causes diminishing stress (Jensen et al., 2007).

Properly arranged, systematic and methodical work places have been created to add value to the working process. Even more literature has emphasized that space

enrolment of sustainable development of office space arrangement, is an important requirement, because some activities may have specific requirements, while other may be more flexible or be able to share common spaces. The designer has to consider about accessibility and special proportional requirements when designing special space arrangements at offices (Ching and Binggeli, 2012).

The way of arranging office furniture affects organizational functions. Furniture have to be arranged either as individuals or groups according to structural space and functional need (Ching and Binggeli, 2012).Furniture arranged in a line proportion also causes workers' positive or engrave emotions (Dazkır, 2009).

Changing the office environment from a traditional to an open plan design affects productivity for government employees occupying tree type organizational positions. Due to changing their physical work environment, different effects are generated on perceived personal privacy, amount of work related communication, job characteristic and job satisfaction supported a hypothesis based on a symbolic meaning approach to explain employees' reaction across different positions in an organization (Zalesny and Farace, 1987).

Space planning, make private spaces, furniture arrangement, Categorization of work group course to productivity according to the literature.

2.2.2 Effect of improving indoor environment on employee productivity

Previous studies emphasizes the importance of improving indoor environment to improve employee productivity (Goodrich, 1982). It gives strong evidence that employees' illnesses are directly caused by bad indoor environment such as sick building syndrome, stress, thermal problems. Nearly two thirds of occupants had thought, an increase of 10% or more of their productivity was possible by improving the office environment (Clemen-crome, 2000). Existing literature contains moderate to strong evidence that the characteristics of buildings and interior, significantly influence the rate of spreading illness and workers' performance. Furthermore, according to Williams' research conducted in the United States, the estimated

potential annual saving and productivity gains are Rs.870 to Rs.2030 billion from reduced respiratory disease, Rs.145 to Rs.580 billion from reduced allergies and asthma, Rs.1450 to Rs.4500 billion from reduced sick building syndrome symptoms and Rs.6000 to Rs.23000 billion from direct improvement in workers performance that are unrelated to health (William, Fiska and Rosenfeld, 2000).

In addition, proper building designing, operation and maintenance can significantly reduce illnesses and it causes reduction of health care cost and improves productivity by developing performance of workers (William, Fiska and Rosenfeld, 2000).

Further, many previous studies point out that health of workers and visually comfort indoor environment can increase workers' productivity. (Heerwagen, 2000)

2.2.3 Relationship between lighting control and productivity

Lighting plays an important role in interior design and can be used to create different moods time to time in the same space. Other than that, lighting can be used as a decorative element as well as a visualizing element. In the office environment, lighting balance is very important because faulty lighting methods can harm visual health and cause other related problems (Hedge, Sims and Becker, 1989)

Level of illumination as an indication of lighting quality also influences workers' satisfaction through productivity (Bodmann, 1967). Several researchers have investigated the relationship between luminance and task performance. It has been shown that lighting luminance and productivity has an opposite relationship up to a specific point and after that it has no progressive relationship. According to 35th annual meeting of Human Factors Society, employees working under parabolic lights reported losing productive time more, because of lighting and associated visual health complains, than those working under pendants mounted in direct light. According to this report, lens indirect up lighting is better than parabolic down lighting (Hedge, 1991). Furthermore, working under full spectrum is known to cause performance and mood improvements where the performance is indicated to be good on one performance measure and to be better on mood measure but the psychological

reaction is recorded negative (Brehm, 1966). However, research concerning direct effect of full spectrum versus cool white florescent light, fail to find any statistically significant lamp type effect on variety of cognitive and affective measures (Jennifer et al., 1991).

Hermans' (1989) research emphasizes the necessity of lighting to improve productivity at working environments. Furthermore the research emphasises the importance of lighting at work related tasks and the effect of emotional and motivational state and health. Other than that, skill, education and previous experience affect productivity. But Lighting is one of the least expensive and important factors that influences human performance in working environment (Herman, 1989). However, during interior design, the designer has to concern on creating less glare, less noise, more pleasant coloured and flicker light to improve productivity and save energy A lot of previous researches have been conducted to explore the relationship between lighting and productivity. None of the case studies clearly indicated that increased luminance or decreased luminance increased the output. However, other than improving productivity, improvement of lighting positively influences errors and accidents (Irens, 1960).

2.2.4 Relationship between colour and productivity

Colour is an important determination of user perception (Wright, 2005) and it plays an important role in visual and psychological comfort, which effects human behaviour. It is also a powerful design element, serving as a tool of communication between people and the built environment (Ozturk, Yılmazer and Ural, 2012). Past investigations and researches prove the importance of colour to improve productivity of humans and also that colour is an important consideration for facility management and a factor that can significantly influence organizational performance because colour can control human anxiety (Table 2.2) (Tucker and Smith, 2007). Colours are basically divided as primary, secondary and tertiary. (Figure: 2.1) Basically, all colours are created by basic colours which are blue, green and red. To conduct their researches, researchers have used commonly used one, two or three colours or

primary secondary colours or brightness of colour, to shrink the research area. Based on these studies, they have come up with some conclusions about the relationship between colour and productivity (*vide infra*) (Valdez, and Albert, 1994).

Table 2.1: A-State Mean by Colour and Trial

Analysis of variance and A-state mean by colour and trial

Source	**MS**	**df**	**F**	**p**
Total	119.33	119.00		
Between	333.67	39.00		
Colour	1320.00	3.00	5.25	<.005
Error	251.48	36.00		
Within	14.35	80.00		
Trials	5.75	2.00		
Colour by trials	27.49	6.00		
Error	14.03	72.00		

According to the psychological effect of primary colours on anxiety (Table 2.02), it is stated that human emotions and colours have a strong relationship. Researches also have found that exact emotions related to colours such as blue, blue-green, green, red-purple, purple and purple-blue were the most pleasant hues, whereas yellow and green-yellow were the least pleasant. Green-yellow, blue-green and green were the most arousing, whereas purple-blue and yellow-red were the least arousing. Green-yellow was found to induce greater dominance than red-purple (Valdez et al., 1994).

Brightness of colours also influences human emotions. Bright colours mainly cause positive emotional associations while dark colours cause negative emotional associations. Also, age and gender cause differences in human emotions in the same coloured environment (Hemphill, 1996, Terwogt and Hoeksma, 1995). Women responded more positively than men to bright colours and they also responded more negatively to dark colours (Hemphil, 1996).

Primary - Red, yellow, and blue. In traditional theory, all colours can be derived from these three shades. They also can't be created by mixing any other colours, and therefore from the basis for all of the "wheels"

Secondary - Green, orange, and purple/violet in addition to the primary colours the reason behind this is they can be create by mixing the original primary colours.

Tertiary - Yellow/orange, red/orange, red/purple, blue/purple, blue/green, and yellow/green are all included with the primary and secondary colours. Again this included basically any colour that can be created by mixing primary and secondary hues, from here, the wheel is open to anything.

Figure 2.1: Primary, Secodary, Tertiary colours

Source : (Albert ,1994)

Table 2.2: Primary colours and anxiety stage

Colour	5min	10min	15min	M
Blue	31.60	30.00	29.80	30.47
Yellow	40.50	42.40	40.40	41.10
Green	32.60	29.80	29.00	30.47
Red	40.70	43.60	43.80	42.70

Source: (Keth, Jacobs and Suess, 1975)

Furthermore, the effects of interior colours on worker productivity or emotions were dependent upon individuals' stimulus screening ability and time of exposure to interior colours. Implications of office workers' long-term productivity are discussed in relation to issues concerning the visual complexity of interior environments (Kwallek, Soon and Lewis, 2007).

Additionally, females indicated more depression, confusion and anger in low-saturated office colours (white, grey and beige) whereas males reported more depression, confusion and anger in the high-saturated office colours (green, blue, purple, red, yellow and orange) (Kwallek et al., 1996).

2.2.5 Relationship between accessibility for facility management for interior design

Perception of services provided by facility management play an important role in users' overall experience of the facility (Fleming, 2004). Modern office workers usually use computers, printers and scanners. On the other hand, modern offices use air conditioners, fire alarm systems, smoke detectors and intercom telephones. These electronic devices' arrangement also significantly causes workers' time saving, work conformability and efficiency. Therefore, networking of these devices is a very important aspect in interior design (Jensen et al., 2002). Telecommunication and networking are the main elements of networking and connectivity, where properly planned and managed building are called intelligent buildings which also contain emergency management systems (Flax, 1991). Client, architect, engineers and facility managers should ensure a good co-operation to create a well performing building because that can help workers' day today activities (Alwaer and Clements-Croome, 2010).

Electricity device locations and data point and plug point locations according workers usage is very important to gain work comfort to workers according to the literature.

2.3 Summary

According to the literature survey, there are numerous factors that impose significant influence on employee productivity in a work place in global context, such as interior space planning, furniture arrangement, lighting, colour and facility management. Some of these factors have been identified to have a direct relationship with productivity while some of them have not exhibited a direct and a clear relationship.

However, the relationship between above factors and productivity had not been clearly identified or extensively studied in the Sri Lankan context. Therefore, the next chapter deals with the methodology adopted in identifying the impact of interior design projects for productivity of employees, in the Sri Lankan context.

CHAPTER 03

METHODOLOGY

3.1 Introduction

Previous chapter discussed literature evidences which emphasize the importance of interior elements to develop employee productivity in an international context. The purpose of this chapter is identifying the research methodological framework used to construct this study including the research approach, data collection methods and the data analysis method.

3.2 Research Approach

Both quantitative factors and qualitative factors such as goal attainment and work accomplished, can be used as a measure of productivity within a workplace (Brain, 1982). Therefore, qualitative and quantitative are the basic research approaches (Kothari, 2004). This research has been associated with an insight into beliefs and values of human, social and organizational aspects of socio cultural phenomenon. The research focuses to study whether as part of the interior design process, there is a possibility to develop productivity on work processes, workplace performance, environmental balance and human comfort, through interior design. This issue has been described according to people's opinions.

In real life, practical issues related to interior design which aim to change the working environment and to enhance productivity, are complex to understand because sometimes the opinions may not be clearly understandable. Interior projects are considered as a contemporary phenomenon. For example, work stress has become a common phenomenon for a growing number of European employees affecting productivity, and then interior design should seek the possibility of addressing the issue (Geurts and Gründemann, 1999). Thus the influence of interior design on work processes, workplace performance, environmental balance and human comfort, can be used as assessment through various methods.

Therefore, qualitative approach is suitable for this research since anticipated research findings are concerned with subjective assessment of attitudes, opinions and behavioural patterns, to answer "how" and "why" questions through case studies. Figure 3.1 illustrates the research process.

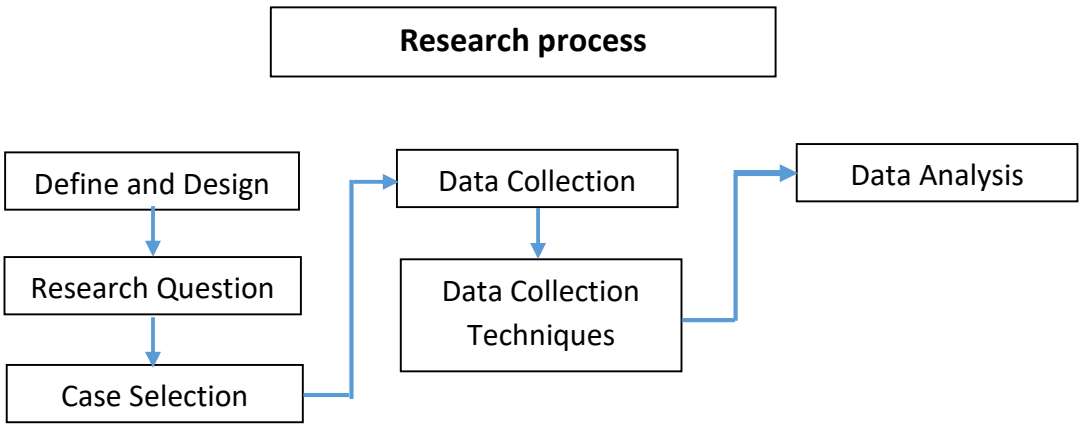


Figure 3.1: Research Process

3.3 Case Study Design

Qualitative case study method provides tools for researchers to study complex phenomena with their context (Baxtev and Jack 2008). A case study design focuses to answer "how" and "why" questions and an empirical inquiry that investigates a contemporary phenomenon in depth and within its real life context, especially when the boundaries between and context are not clearly evident (Yin, 2003).

A case study design provides surprisingly strong guidance in determining what data to be collected and the strategies for analysing data.

3.3.1 Case selection

Researchers can conduct either a single case or multiple cases depending on the issue in question. In this study, multiple case study method was used, because single case studies are usually appropriate for experimental studies on well-established theories. On the other hand, multiple case designs are preferred, since the larger the number of

cases, more robust are the research outcomes. However, a frequent question is that how many cases should be included in a multiple case study (Rowley, 2002). In this research, a multiple case study was more suitable because its aim was to observe more employees who are engaged in varying professions within a limited time period. A multiple case study enables the researcher to explore differences within and between cases. The goal is to replicate findings across cases. Because comparisons will be drawn, it is imperative that the cases are chosen carefully so that the researcher can predict similar results across cases, or predict contrasting results based on a theory (Yin, 2003).

Main concern in case selection has been to fulfil the objectives of the research study. Therefore, three well organized offices and two not well organized offices were selected. It is beneficial to understand the importance of an organized office space and how such interiors can lead towards productivity.

In this research, multiple case studies were conducted because it is required to conduct a comparative study. Following (Table 3.2) are details of the case studies that were selected.

Table: 3.1: Selected Cases

	Case study Name	**Case Description**
01	Case Study 01	It is a Furniture manufacturing company. The company has done major interior developments in 2011 and 2015 to add some visual to the departments (Eg. Pieces of art). In its office, 30 number of office staff are employed. On the day of the survey, 24 people were present at the company but within 4 hrs time only 10 people returned the questionnaire. This staff consists of quantity surveyors, designers, marketing executives, accountants, secretary and clerks.

	Case study Name	Case Description
02	Case Study 02	It is a shipping management company who shifted the office to a new building in 2014. 25 office staff are employed. On the survey conducting day, 20 people were present at the company but within 4 hours' time, only 14 people returned the questionnaire. This staff consist of clerks, accountants, system administrator, superintendent, mangers, secretaries and personal offices.
03	Case Study 03	It is a geological survey and mines bureau. 25 office members are working in the office. Geologists, engineers, clerks and project managers participated in the questionnaire survey.
04	Case Study 04	It is an architectural office. 20 employees including quantity surveyors, draughtsmen, clerks and accountant are employed. On the day of the survey, only 12 staff members filled the questionnaires.
05	Case Study 05	It is a property development and water distributing company. 13 staff members filled the questionnaire out of 20 staff members, within 4 hours. The staff consists of sales coordinators, engineers, quantity surveyors and clerks.

3.3.2 Data collection methods

Usually, primary data can be collected through experiment or survey (Kothari, 2004). Therefore, in this study, case study data collection was done based on observation, questionnaire surveys and personalized interviews. Observation is very important to understand workers' behaviour through the office environment and to analyse the data which they have delivered through the questionnaire. Furthermore after data

analysis, the results were clarified through telephone conversations with managers of respective companies.

3.3.3 Data collection

Data for case studies can come from many sources of evidence. Six important ones are discussed by Yin documentation, archival records, interviews, direct observation, participant observation and physical artefacts (Yin, 2003).

In this research, the initial phase of data collection was focused on identifying important factors that can be used to analyse productivity. A questionnaire was used to collect data from employees of the selected companies. Therefore, a questionnaire was developed to guide them to obtain facts on how interior design benefited their productivity. The questionnaire survey focused on studying how interior of an office affects motivation of workers' day to day work, health problems related to work and workers' opinion about space planning of interior design. Thus, it was focused on following factors;

1. Furniture arrangement
2. Partitions
3. Colour of walls
4. Lighting level
5. Visuals
6. Printer Location
7. Categorization of work group
8. Data point and plug point location
9. Space planning
10. Health problems
11. Opinion about interior and health relationship
12. Suggestions to improve productivity at office

Respondents were asked to indicate the impact of each factor on employee productivity on a 5 point scale as follows.

1 point – Not at all
2 points – Slightly
3 points – Moderately
4 points – Highly
5 points – Very highly

63 employees including clerks, accountants, coordinators, quantity surveyors, sales officers and receptionists participated and successfully completed the questionnaire.

In the second phase of data collection, 23 (See table 3.2) interviews were conducted with selected managers to clarify employees' opinion on above factors. In personalized interviewing, in depth descriptions, fact on particular matters and their opinion about real contextual problems and their views of solving day today problems could be requested. Semi structured questions were used for the interviews. In other words, although it was pursuing a consistent line of inquiry, actual stream of questions in a case study interview is likely to be lurid rather than rigid (Rubin and Rubin, 1995).

Table 3.2: Participants of the interviews

Case study	Number of managers face to face interview	Number of managers telephone conversation
Case 01	5	2
Case 02	4	3
Case 03	2	2
Case 04	3	0
Case 05	4	0

Further, employees were observed to identify the behaviour and interaction patterns among colleagues and furthermore, pictures were taken to record the observations. The observations can be very valuable and that may even consider taking photographs at the case study site (Yin, 2003).

3.4 Data Analysis

Cross case analysis ensures how positively factors such as furniture arrangement, partitions, colour of walls/partitions, visuals and service distribution influence productivity, through five selected case studies based on discussions conducted with employees and managers.

T test was used to identify significant productivity factors. Further cross case analysis was carried out to analyse each of further factors affect to productivity which are identified by T-test. In the T-test, H_o is the null hypothesis and H_1 is the alternative hypothesis. The notations μ and μ_o are population mean and critical rating above which the issue was increased or not, respectively. $\mu = \mu_o$ in the null hypothesis, and $\mu > \mu_o$ in the alternative hypothesis. In this analysis, μ_o was fixed at 3 because these test parameters cause an entirely positive impact on resulting productivity.

According to the findings obtained by T-test, semi structured interviews and telephone conversations were carried out with management of these offices to clarify the findings on employee productivity. In these conversations I mainly tried to get the opinions of the management regarding the relationship between interior design and productivity.

3.5 Summary

This chapter was focused on summarizing the research method which was used to conduct the research. This research was conducted as a qualitative research based on case studies. Case study data collection was based on observation, questionnaire surveys and personalized interviews. The t-test used as the main data analysis technique and it was used to analyse data from the questionnaire survey and semi structural interviews and telephone convocations. Also cross case analysis was carried out to find out the effectiveness of interior design to improve the productivity relevant to the parameters identified in the literature survey

CHAPTER 04

RESEARCH FINDINGS

4.1 Introduction

The methodology adopted to carry out the research was descriptively discussed in the previous chapter as Furniture arrangement, partitions, colours of wall and partitions, light level, visuals, facility locations, categorization of work group, service distribution, and space planning relationship with productivity through several surveying methods. And list out findings one by one case through case by case according to parameters found out parameters on literature review. Research findings obtained through statistical data analysis and visual observations on site and cross case analysis are discussed in this chapter.

4.2 Results and Findings

4.2.1 Productivity parameters

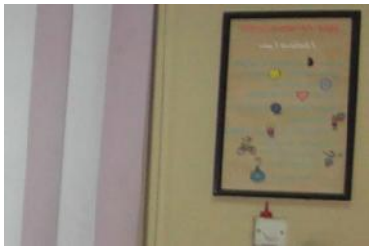
Based on critical values of **T**-distribution, when the degrees of freedom = 62 (63- 1) and the level of significance for one-tailed test is set at 0.05, the t value is 1.645. This meant that, if the calculated t value was greater than 1.645, the null hypothesis was rejected. It was then concluded that the factor effectively affected productivity of employees. The results are shown in Table 4.01 below. Through the t-test conducted for the sample, four parameters out of nine parameters which more effectively contribute to employees' motivation and work efficiency were identified. According to the one tale t-test results, furniture arrangement, colour of walls, visuals and service distribution have been identified as significant in employees' productivity.

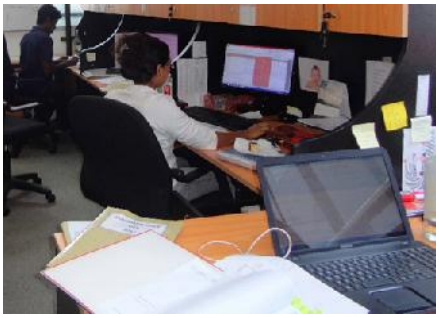
Table 4.1: Significant inductively measures

Measures	Mean	t-test	
		t value	Sig. Level
1. Furniture arrangement	**3.34**	2.06	0.05
2. Partitions	3.00	0	1.00
3. Colour of walls / partitions	**3.39**	2.07	0.05
4. Light (luminous) level	3.052	0.25	0.80
5. Visuals	**3.75**	4.43	0.00
6. Facility location	3.13	0.69	0.49
7. Categorization of work group	3.21	1.24	0.22
8. Service distribution	**3.39**	2.43	0.02
9. Space planning	3.34	1.88	0.07

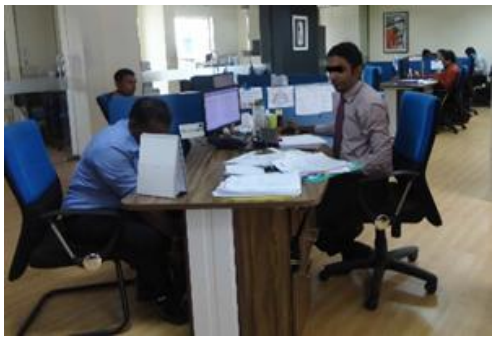
Table 4.2: Research findings

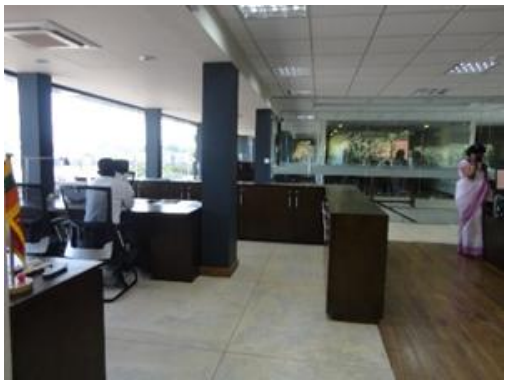
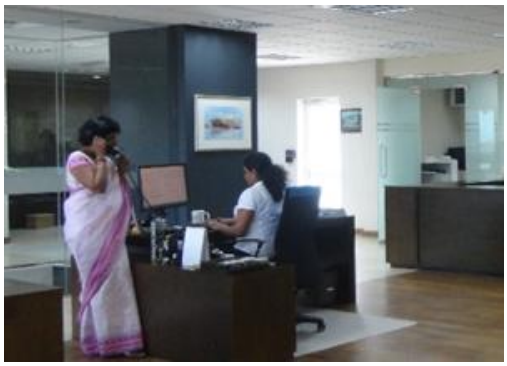
Case 01	
Description	**Conceptual Images**
Furniture Arrangement	
design department table arrange more closer with small part ion to device table without cover people, accounts and quantity surveyor department furniture arrange with partitions and project department and marketing furniture arrange without partitions	 

	
Colour of wall	
Creative department use red colour art wall, procumbent department use yellowish colour wall, marketing department use red colour wall, project department blue colour wall and other area white colour with brown furniture	  
Visuals	
Full height partitions had been used to divide work groups, Feature wall use to create visually attractive environment.	 

	
Service distribution	
Supply switch point, Plug points and data according to requirement of work and Printer and fax locate in one place center of the office.	 

Case 02	
Description	**Conceptual Images**
Furniture Arrangement	

	 
Colour of wall	
All walls in white colour, and blue partitions but black use rarely.	 

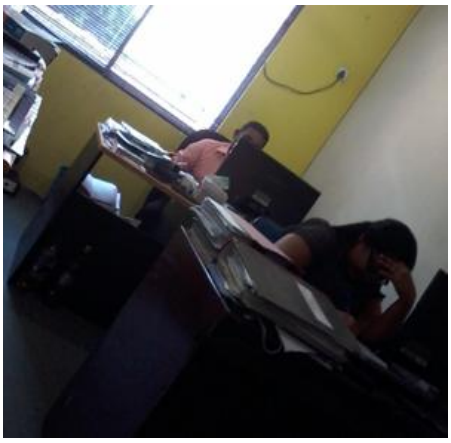
Description	Conceptual Images
Visuals	
Glass windows use to acquire attractive natural views in to the office, also hung pictures on walls and placed models of ships on podiums to create visual comfort and work related artistic space.	
	
	
Service distribution	
Each and every table consist of data point, 13A 2Nos. of socket outlet, intercom line. Printer and fax in one place other than directors separate printers	

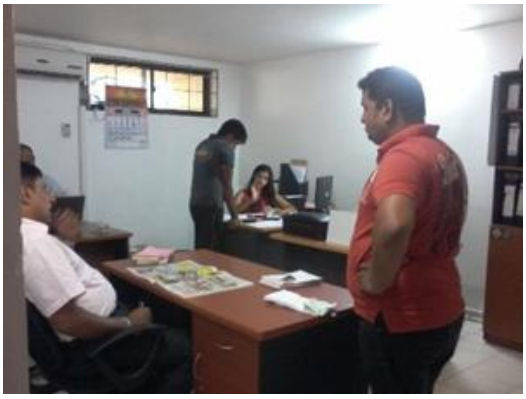
	

Case 03	
Description	**Conceptual Images**
Furniture Arrangement	
Partition according to work team.	 

Description	Conceptual Images
Colour of wall	
Use natural colours which emphasis the natural finish of materials.	
Visuals	
Use block walls create artistic environment.	
Service distribution Intercom line connect to each and every table and Data, point install on officers table who work with computers and printer and fax in separate place.	

Case 04	
Description	**Conceptual Images**
Furniture Arrangement	
Work place not arrange properly according to work. Place tables according to workers opinion.	

	 
Colour of wall Basically use white colour on walls	
Visuals	
Did not do any special thing to visual comfort	

Case 05	
Description	**Conceptual Images**
Furniture Arrangement	
Not arrange proper manner, worker place tables according to their opinion, most of the time wasting office space and create unusual traffic within working tables.	 
Colour of wall Basically use white colour on walls	
Visuals Did not do any special thing to visual comfort	
Service distribution Data point, power point place on working desk and printer place on middle of the work place.	

4.3 Cross Case Analysis

4.3.1 Furniture arrangement

In case 01, a manager discussed about interior arrangement and physical arrangement of furniture which cause efficient behaviour of employees. Some previous studies also provide evidences that physical arrangement of furniture can improve productivity of employees (Davis, 1984). Furthermore, in the manager's point of view, furniture arrangement takes the main role in developing team work. In case 01, Directors' office area is a very good example to validate this finding (Figure: 4.3) the manager of Case 01 mentioned that maintaining privacy among workers improve productivity. Also in case 01, the General Manager of the creative department pointed out that tables and storages should be built close to employees because such a *furniture arrangement increases the speed of work* (Figure : 4.1). Furthermore, a user of case 03 explained that *he can work much easier with the new furniture plan compared to the older one*. Besides, the manager of case 02 explained that a worker spends most of the time near the furniture and its arrangement and comfort affects workers' productivity. On the other hand, in the case of the company with unplanned interior, 5 workers' opinion has been that it is required to arrange furniture according to the team and in a more comfortable way so that it will increase productivity and speed of work. Furthermore, according to case 02 employees' opinion, comfort of the chair also affects productivity of employees. During workplace planning of the company in case 02, they had tried to maintain 60 to 100 square feet within a group of 4 people. Proper distance between workers that follows designer advice causes team work development and also, by keeping the workstation area in the recommend range of 2.4 m x 2.4 m to 3.6 m x 3.6 m as specified by Veitch, Charles and Newsham (2004).

Figure 4.1: plan view of Examination department and HR department.

Further through discussion, managers and workers in case 02 clarified that furniture arrangement and furniture comfort influence continuous working Bechtel and Churchman (2002) have proved this through their research. Furthermore, based on observations of workers in office environment case 03 and case 01, they were apparently more comfortable with the office furniture arrangement since they stay in one place and interact with other team members and work in a good mood.

Overall, furniture arrangement of office affects clerical staff most and professional staff least when changing physical arrangement from a traditional office to open concept (Zalesny and Richard, 1987). Thus, the shipping office in case 02 successfully gained more productivity through the Accounts Department (Figure: 4.2) and Human Resources Department (Figure: 4.3), by changing the traditional office into the open office concept, according to manager's opinion.

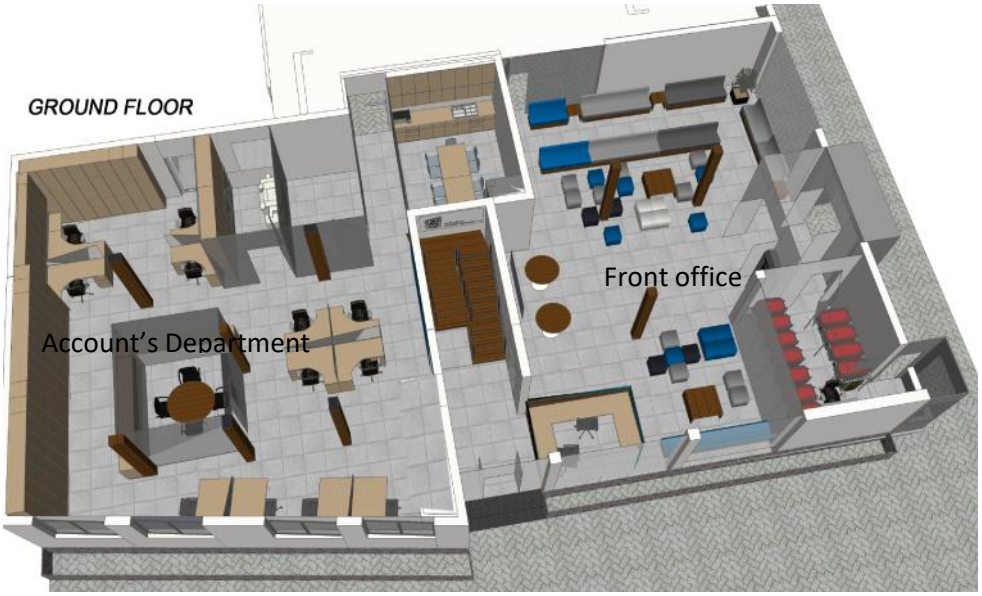


Figure 4.2 plan view of accounts deparment and Front office

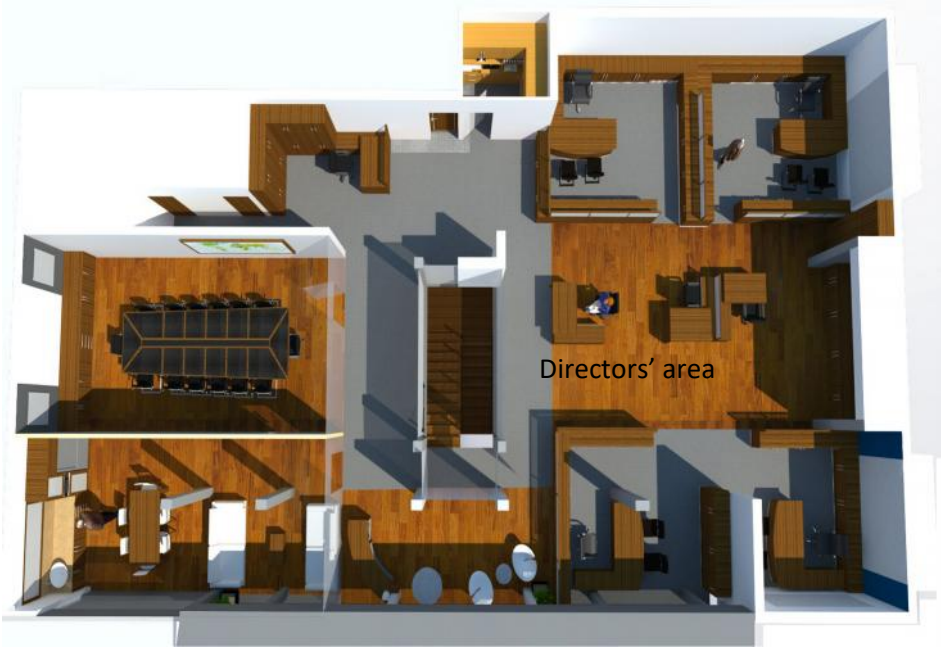


Figure 4.3: Plan view of director's area

As a summary, furniture arrangement course to productivity such a way as develop team work,effect to speed of work, Continuity of work.

4.3.2 Colour of walls and partitions

According to all five case studies, most of the respondents were considerate about colours. According to the management's opinion of case 01, the speed of work of the creative department which employed a young crowd, increased after renovation. Their working area was white earlier, and recently renovated with red and brown for walls.

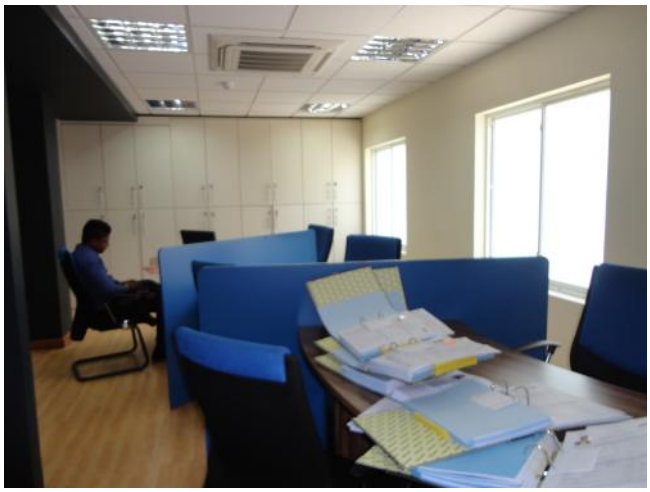


Figure 4.4: Case 02 interior

In case 02, the management had identified that young employees like to work in blue environment mixed with white and they work faster after setting this colours to the environment. In case 02, employees mostly carry out clerical work and data entry. Additionally, case 02 had used white for most of the places and mixed it with blue colour for partitions (Figure: 4.4).

According to literature, researches prove above opinions as follows. Long wave length colours such as red and yellow are more erosive than short wave length colour such as blue and green (Valdez and Albert, 1994). On the other hand, blue has been identified as calm, cool, and positive (Bellizzi and Robert, 2006). Before renovation of case 02, the employees have worked in a dark office with a neutral yellow and brown colour environment. According to literature, blue is a cool, calm and positive colour which helps to concentrate on work with a calm mind. Data entry operators and clerks have to work in a calm environment and need to concentrate on

documents. Hence, Bellizzi and Robert (2006) proves the opinion of the management in case 02. Furthermore, the office space of case 04 (Figure: 4.5) had used green in some areas and black in some others.

Figure: 4.5: Case 04 interior views

In case 04, green colour areas are occupied by quantity surveyors and draughtsmen. According to the representatives' opinion, the green walled area is preferred to the black walled area. Black represents death, mourning, widowhood, (interior design, 2016). Further, a Quantity Surveyor in case 02 mentioned that, a green area encourages to work continuously. *Green represents calmness and cleanness* (Bellizzi and Robert, 2006) and. Thus employees' and managers' opinions obtained through discussions, prove that chosen interior colours effect on working positively. On the other hand positive work mood causes to gain productivity.

As a summary, colours course to increase of productivity through increse speed of work and motivation of work.

4.3.3 Visual

Physically and visually comfortable environment improves workers' satisfaction and wellbeing. It influences employees' performance and maximizing performance of employees directly contributes to achieving organizational goals (Myriam, Jennifer and Guy, 2010**)**. Therefore, in case 02, managers were more concerned about visual aspects.

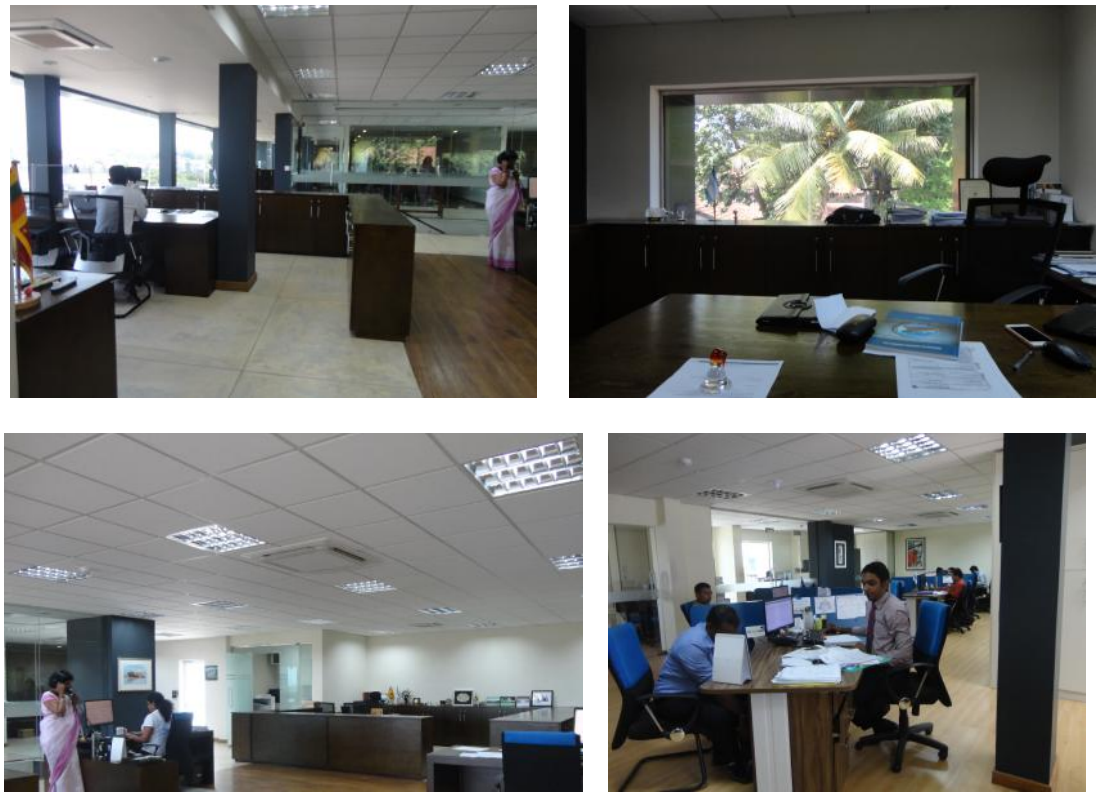


Figure 4.6: Case 02 views of office

During interior renovation they had created large glass windows to aquire attractive natural views in to the office. Maximum access to windows and day light causes improvements in employee motivation and comfort (Veitch, Charles, Newsham, Marguardt, Geerts, 2003). They had also hung pictures on walls and placed models of ships on podiums to create visual comfort and work related artistic space (Figure 4.6) because they believed it causes employees' motivation towards work.

Case 02 manager 01 had experienced that the quality of work of people improves in this new environment and they enjoyed the environment as well than the early office. Also, according to manager 01 in case 02, the accuracy of work of workers in the accounts department's window less part was lower than others and they had rebuilt that windowless part more decoratively with visuals in order to improve workers' mood toward work. Furthermore in case 01, art walls had been created in some places (Figure 4.7) and wordings such as *"I love my job, I like to work here, an error doesn't become a mistake until you refuse to correct it"*. According to managers,

employees after being exposed to newly placed visual artefacts and wordings, they started new tasks in a positive and energetic way. Motivation wordings hence support to create moral and motivation toward work (improving employee morale motivation, 2016).

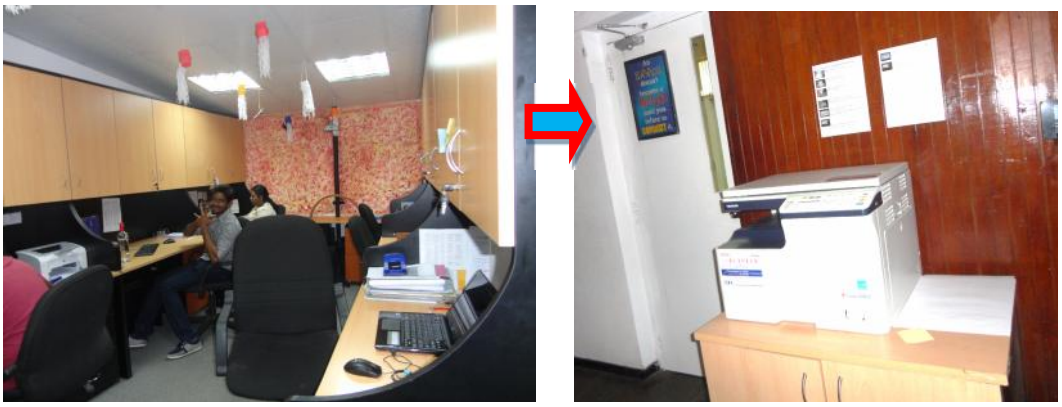


Figure 4.7: Case 01 interior view

Also, they had tried to incorporate natural environment in to the office using large windows as much as possible. On the other hand, according to employees' opinion, they can work more hours in visually comfortable environments with natural and artistic views and also can concentrate well on work. Thus visuals create productivity of employees in offices.

As a summary, Visuals support to develop productivity of employees through Increase motivation of employees and developing accuracy of work.

4.3.4 Service distribution

Service distribution is one of the major components in office interior design, since it not only contributes in changing culture of work in an office, but also helps in gaining more productivity through efficient use of small spaces (Van der Voordt, 2003 and Riratanaphong and Voordt, 2011). Also, in all case studies conducted within this study, basically the opinion of all managers was that service distribution is the main factor to be considered during interior work, because all employees use computers and electronic items to maintain quality of work and manage time, or in

other words, providing easy access to data points, socket outlets and remote control systems has directly influenced in accelerating work and improving productivity of employees.

Figure 4.8: Case 02 – Work station service distribution

Furthermore, regarding data point and plug point location in case 03, it was mentioned in the questionnaire that *it is better to locate them on the floor rather than inside the table since it causes easy access.* According to the manager, they use an intercom system and also individual telephones to call outside. According to respondent 02 of case 01 and case 02 (Figure 4.8) *intercom service and internet service distribution causes increasing of quality of work because, as a communication method, emails ensures easy communication with outside people, and intercom service helps save time because employees can communicate within the office without going and meeting work related people in person, time to time. Furthermore, occasionally meeting other employees at office also reduces speed of work of the staff surrounding the employee, since the employee standing and walking through the department is a disturbance to others' concentration.* According to manager 02 of case 03 also, individual telephones are used to call internally and for outside coordination in working inside the office and field work, and therefore individual telephone distribution is an important aspect to be considered during an interior design project to ensure proper management within an office. Additionally in case 03, employees' opinion was that, data distribution causes improvement of

working accuracy and easy execution of technical work that require electrical power and data while convenience of plugging devices to nearby workstations reduce working and waiting time for obtaining power to out some work that requires power.

In case 01, the staff consists of employees of different professions such as designers, accountants, marketing and sales representatives, in case 02, clerks, sectary and document controllers while in case 03 also, the staff consists of engineers and clerks.

Figure 4.9: Case 03 office

According to respondent opinions, basically all professions prefer private work places with new technological and electrical equipment related to their work and easy access to equipment in order to increase the quality of service and productivity of work. Even in case 03 (Figure 4.9) and case 04, special concern was given for proper service distribution in some degree, because if not, with the new technology it would be difficult to achieve service targets.

As a summary, proper service distribution Increase quality of work, save time and increase working accuracy of employees.

4.4 Summary

This chapter included a discussion on research findings and analysis of data. Firstly, it discussed the effectiveness of measures to increase productivity of employees through questionnaire survey results using SPSS software. The appraisal study discusses more about findings and questionnaire results. Then the cross-case analysis further validated the research findings obtained from the results of the T-test, visual observations. The findings presented in this chapter were further validated by comparing with literature findings. .

Final results, limitations of this study and further research recommendations are discussed in Chapter 05

CHAPTER 05

CONCLUSIONS

5.1 Conclusions

The aim of the study was to understand interior design parameters which cause development of employee productivity. During the research study, different interior planning in office spaces was used to identify the factors related to interior design that contribute to improvement of productivity.

Basically through the literature review, factors which cause productivity of employees (furniture arrangement, partitions, colour of walls, lighting level, visuals, printer location, categorization of work group, data point and plug point location and space planning) in the global context, were identified. Based on the these factors mentioned above, the research study was planned and conducted for the Sri Lankan context through close observation, questionnaire surveys, semi structured interviews and telephone conversations.

Data collection was carried out as multiple case studies conducted at offices with proper interior development. Collected data was analysed statistically using the SPSS software. Furthermore, in order to clarify the results obtained, telephone conversations were conducted with the managers. According to the data analysis results, furniture arrangement, colour of walls, visuals and service distribution were identified to be more significantly involved in improving employee productivity, in the Sri Lankan context out of all the nine influential interior design parameters identified through the literature review.

According to research findings, proper furniture arrangement ensures efficient behaviour of employees and significantly improves teamwork and speed of work while comfortable furniture encourages continuous working. Furthermore, the way of proper furniture arrangement is different for different professions. As an example creative department usually does team work to improve their designs in that case

furniture arrangement need to prepare accordingly. Also clerical and accounts staff need more privacy during work according to observations. Proper furniture arrangement increases the speed of work. Further, the findings suggest that use of colour affects employees' motivation and speed of work. For an example, blue and white together improves speed of work of young employees who carry out clerical work and data entry and use of green for walls improves employee productivity through encouraging continuous working compared to black colour. Visually attractive artefacts, such as displaying motivational wordings and quotes, establishing windows to get outside views to inside of the office increase morale, motivation and comfort of employees. According to this study, service distribution within an office space causes convenience in communication within the office and also with the outsiders and increases the service status, while saving time by minimizing movement inside the office and waiting time to use electrical equipment.

However, it was noticed that sometimes employees had not provided accurate data due to their inadequate understanding about the question or due to carelessness in filling the questionnaire.

5.2 Limitations of the Research

The research was carried out within a limited time period due to which collecting data to cover the whole country or all offices in Colombo was not achievable. Therefore, Colombo was selected as a sample area because the majority of offices are situated in the commercial capital of Sri Lanka, Colombo. Also, to select cases from the Colombo district, the main concern was to select offices which had recently finished interior designing and those which had not, in order to compare the results.

5.3 Further Research

In future researches, this matter can be explored in more depth for the Sri Lankan context other than the Colombo area. Furthermore, how interior design can minimize health problems of employees within working hours to develop productivity can be studied, because if employees suffer from health complications during working time, it would in turn reduce the productivity of employees.

REFERENCE

Alder, D. (1999). Matric handbook (2nd edition), Architectural press, Linacre house, Jordan hill, Oxford OX2 8DP.

Allison, C.W. (2009), Interior *Design and/or Interior Architecture,* The Discussion Continues, Interior design 35(1)

Alwaer, H., Clements-crome, D. J., (2010) Key performance indicators (KPIS) and priority setting in using the multi-attribute approach for assessing sustainable intelligent building. Vol: 45, issue 4, 799-807.

Aslam, 2016 05 22, Design and Architecture,http://designlike.com/the-psychology-of-color-for-interiordesign.

Baizhan, L., Clements-croome, D. (2000). Productivity and indoor environment. *Proceedings of healthy buildings*, 1, 629

Baxter, P., Jack, S. (2008). Qualitative case study methodology: study design and implementation for novice researches. *The qualitative report*, 13, 544-559

Bellizzi, Joseph A.; Hite, Robert E. (1992), Environmental Color, Consumer Feelings, and Purchase Likelihood, *Psychology & Marketing*, Sep/Oct92, Vol. 9 Issue 5, p.347-363.

Bodmann, H. W., (1967), Quality of interior lighting based on luminance, Vol. 32, 22-40

Brain D. (1982). *The Productivity Prescription*. McGraw-Hill, New York.

Brehm, J. W. (1966), *A theory of psychological reactance*. Academic press, New York, London

Chandrasekar, K. (2011). Workplace environment and its impact on organisational performance in public sector organisations. *International journal of Enterprise computing and business systems*, 1(1),

Chin D. K. F.Binggeli, C. (2012), *Interior design illustrated*, John Willey ^ Sons inc

Churchman, A., (2002), *Environmental psychology and urban planning Where can the twain meet*, (Published PhD thesis) Faculty of Architecture and Town PlanningTechnion Israel Institute of Technology.

David, C., (1983). *Purpose, process, place: design as a research tool*, Property Management & Built Environment, 10.1108/02632771111109243

Dazkir, S. S., (2009), *Emotional effect of curvilinear vs. rectilinear forms of furniture in interior settings*. Degree of Master of Science in design and human environment, Oregon State University.

Demetriaos J. Moschandreas, Design, Construction, and operation of health buildings. American society of heating, refrigerating and air conditioning engineers, Inc.

Fisk, William, J. (2000). *Health and productivity gains from better indoor environments and their implications for the U.S. department of energy*. Lawrence Berkeley national laboratory, 25, 537-66

Flax, B.M., (1991), Intelligent buildings, IEEE Communications Magazine Vol:21,issue 4,24-27

Francis Duffy, Andrew Laing, Vic Crisp, (1992) *The Responsible Workplace*, Facilities, Vol. 10 Iss: 11, pp.9 – 15

Gaetjens, A.k., (1942), *Lighting maintenance in war industry plants*, international labour office, Montreal.

Geurts, S., Grundemann, R., (1999), *Workplace stress and stress prevention in Europe.* Taylor and Fransis library.

Gifford, R., Hine, D. W., Veitch, J. A. (1991). Demand characteristics and full spectrum lighting effects on performance and mood. *Journal of environmental psychology*, 11, 87-95

Goodrich, R. (1982), *Seven office evaluations*, Sage journal, Volume 14,353-378

Hedge, A. (1991*). The effects of direct and indirect office lighting on VDT workers.* Cornell University: Department of design and environmental analysis

Hedge, A., Sims, W., Becker, F., (1989), *lighting the computerized office*: A comparative study of parabolic and lensed-indirect office lighting systems, Vol.33.521-525

Irens, A. N. (1943), *Light and productivity*, Public affairs ,administration and management,Vol.25,2-1960

Jacobs, K. W., Suess, J. F. (1975). *Effects of four psychological primary colors on anxiety state*. University of Sourbern Mississipi

Jennifer, A, Veitch, Robert, G., Donald, W.H., (1991), *Demand characteristics and full spectrum lighting effects on performance and mood*. Environmental Psychology, Vol.11, 87-95.

Jesen, R., Stovner, L. J., Hagen, K., Katsarava, Z., Lipton, R. B. Scher, A. L.,Scher, A,I., Steiner, T. J., Zwart, J.A. (2007)**.***The global burden of headache's*, documentation of headache prevalence and disability worldwild,27,193-210

Juriaan van Meel, 2000: The European Office: Office Design and National Context, Rotterdam

Katzev, R. (1992). *The impact of energy-efficient office lighting strategies on employee satisfaction and productivity*. Portland: Sage publications

Keith, W., Jacobs, James, F., Suee. (1975), *Effect of four psychological primary colours on anxiety state*. Perceptual and motor skill, Vol.41, 207-210.

Kothari, C. R., *Research methodology*, University of Rajasthan, Jaipur. New age international (p) limited.

Kwallek, N., Lewis, C. M., Lin-hsiao, J. W. D., Woodson, H. I. (1996). *Effects of Nine Monochromatic Office Interior Colors on Clerical Tasks and Worker Mood.* Austin, Texas: The University of Texas, Austin Division of Interior Design.

Kwallek, N., Lewis, C. M., Soon, K. (2007). *Work Week Productivity, Visual Complexity, and Individual Environmental Sensitivity in Three Offices of Different Color Interiors*, interior colour research and application, Vol:32, 130-143.

Lewis, C. M., Kwallek, N. (1990).*Effect of environmental colour on male and females: a red or white or green office.US national library of medicine,* Volume 21 (Issue 4).

Meel, J. V. (2000). *The European Office:* Office Design and National Context. Rotterdam

Myriam, B.C.A., Jennifer, A.V., Newsham, G.R.(2010).*Windows, view, and office characteristics predict physical and psychological discomfort*, Journal of environmental psycologhy, Volme 30(Issue 4).

Ozturk, e., Semiha, Y., Ural, S. E. (2010), The effect of achromatic and chromatic coliur schemes on participants' task performance in and appraisals of an office environment. Department of Interior Architecture and Environmental Design and the Institute of Economics and Social Sciences of Bilkent University

Robert, B., Churchman, A. (2002), *Environmental phycology, New york*, John Wiley and sons, Journal of environmental behavior.

Rolloos, M. (1997). *A healthy indoor environment itself pays Praktijk boek healthy buildings*, October, Journal of building economics and finance, A 2001-3-18

Rubin & Rubin (1995), Qualitative interviewing" the art of hearing data. London" Sage publication

Smith, A., Tucker, M. (2007). *User perceptions in workplace productivity and strategic FM delivery*. *Facilities*, 26, 196-212. Doi 10.1108/ 02632770810864989

Sustermeister, R,A., 1976. *People and productivity.* Mcgraw hill book company.

Valdez, P., Albert, M. (1994), *Effect of colour on emotions*, Journal of experimental PsychologyVol.123,4, 394-409.

Veitch (2004),*Creating the productive work place*, Milton park,, J.A., Charles, K. E., Newsham, G.R.Taylor and Fransis.

Veitch, J. A., Charles, K. E., Newsham, G. R., Marguardt, C. J. G., Geerts, J. (2003), *environmental satisfaction in open-plan environments:5*. Workstation and physical condition effects, http://doi.org/10.4224/20378817.

Virgina, I.L., Carolin, H., Pearson-Mims, and Geogia, K.G. (1996).*Interior plants may improve worker productivity and reduce stress in a windowless environment*, Environ horticulture. 14(2):97-100.

Wiley Periodicals, (2007), *Colour research and applications*,. Department of Interior Architecture and Environmental Design Bilkent University; Appl, 32, 130 – 143,

Wiley, (2007). *Effects of environmental colour on males and females: A red or white or green office Periodicals*, US National Library of Medicine National Institutes of Health, Col Res Appl, 32, 130 – 143

Yin, R. K. (2003). Case study research: Design and methods (3rd ed.). Thousand Oaks, CA: Sage.

Zalesny, M.D.,Farace, R. V., (1987), *Traditional versus open office*, A comparison of sociotechnical, social relations, and symbolic meaning perspectives, *2 240-259*