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SAST & AHP in Determining The Best Strategy of Office Ergonomics Program Improvement to Prevent Risk of Musculoskeletal Disorders At XYZ Company Qatar

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Abstract

The Ergonomics Program has been recommended by many studies as one of the main guidelines in equipping employees at work to prevent injuries and health problems. One of the main benefits gained from implementing the Ergonomics Program is that it reduces the risk of injury by adapting work that suits humans, not forcing humans to adapt to work. Offices that are designed using ergonomic principles can improve performance and reduce workplace injuries such as musculoskeletal disorders (MSDs). This study aims to obtain strategies of Office Ergonomics Program Improvement to prevent risk of musculoskeletal disorders (MSDs) cases in XYZ Company Qatar. The research approach was conducted through qualitative descriptive using expert based approach (System of System Methodology - SoSM). The study began by analyzing data on MSDs cases and sick leave related to MSDs. The results of analysis are taken into consideration when collecting assumptions for office ergonomics program improvement and its level of importance and certainty. The method used is Strategic Assumption Surfacing and Testing (SAST). Prioritizing strategic assumptions are determined using the Analytic Hierarchy Process (AHP) method. The data obtained were analyzed using Software Expert Choice 11. The results of analysis showed that Policy and procedure had the greatest value with 0.256, while the workstation was 0.219, health check-up 0.059, awareness program 0.087, regular exercise 0.202, training 0.088 and supervision / monitoring 0.089.

Keywords: AHP, SAST, Office ergonomics, Musculoskeletal Disorders.

I. INTRODUCTION

Background

In recent decades, there has been a strong tendency for corporate and business organizations to reconfigure their office space in new ways and models. In addition, it shifted to a more attractive and a flexible work environment. The need to meet various expectations and requirements from employees relating to the management of a work space that is safe, comfortable and does not cause health problems.

The Ergonomics Program has been recommended by many studies as one of the main guidelines in equipping employees at work to prevent injuries and health problems. One of the main benefits gained from implementing the Ergonomics Program is that it reduces the risk of injury by adapting work that suits humans, not forcing humans to adapt to work. Offices that are designed using ergonomic principles can improve performance and reduce workplace injuries such as musculoskeletal disorders (MSDs).

Musculoskeletal disorders (MSDs) are a condition of impaired joints, ligament, muscle, nerve and tendon and spinal function. Musculoskeletal disorders can occur in any area of the body including the neck, shoulders, wrists, back, legs, knees and feet. The causes of musculoskeletal disorders vary greatly: elderly due to degenerative cells, repetition of movements, poor work position, excessive use of muscles, static positions such as prolonged sitting, height, weight and work posture.

Based on the U.S Bureau of Labor Statistics (2014), the average office employee with musculoskeletal disorders is 32%. Mahmud (2011) mentions that the number of cases of work related musculoskeletal disorders occurred in 33.8% of the 10,000 employees and the worker needed 13 days to recover and return to work.

The XYZ company branch office is the focus of this research has implemented a policy regarding ergonomic principles that are part of the Ergonomics Program, but in fact there are still a number of cases of Musculoskeletal Disorders (MSDs) where some employees complained about the condition of their office space that caused several conditions of health problems such as lumbago, stiff neck, back pain, tingling of feet and hands, headaches, dizziness, Carpal Tunnel Syndrome, tennis elbow, lower back strain and others. This condition if left unchecked will lead to declined performance, increased absence due to sick leave which will ultimately affect the productivity and performance of the company in general.

Data taken from the results of the Office Ergonomic Self Risk Assessment (OPERA) throughout the period of 2016 - 2018 thru periodic medical check-up program showed results that were almost constant at an average rate of 11% of workers who had high risk of Musculoskeletal Disorders.

This study aims to obtain strategies of Office Ergonomics Program improvement to prevent risk of musculoskeletal disorders (MSDs).

Literature Review

According to the International Ergonomics Association (IEA), (2019) Ergonomics (or human factors) is a scientific discipline that deals with understanding of interactions between humans and other elements of a system and profession that applies theories, principles, data and methods to design and optimize well-being human and overall system performance. O'Neil (2011) in his article "Office Ergonomics Standards; Layperson's Guide ", confirms that furniture designed using ergonomic principles can improve performance and reduce workplace injuries such as musculoskeletal (MSDs).

The Washington State Department for Labor and Industry in its document: "Office Ergonomics - Practical Solution for a Safer Workplace (2002)" identifies office ergonomics and defines it as an ergonomics branch that deals specifically with the office environment. This ergonomic field considers how important elements in the workplace such as workstations, computers, chairs, lighting, noise levels, room temperature, etc. can be adjusted to improve employee's health, safety and performance. The goal of Office Ergonomics is to design the work station of the worker's office so that it suits the worker and allows a comfortable work environment for maximum productivity and efficiency.

Winnie (2014) in her article "Five Critical Elements for Managing an Ergonomics Program" states that the success of the Ergonomics Program focuses on identifying, measuring and reducing the risk of Musculoskeletal Disorders (MSDs) factors. Five key elements in Ergonomic Programs include: 1) Target Cause, 2) Common Goal, 3) Top Down, 4) Familiar System, 5) Regular Checks. According to the results of Kuswantoro's research (2017), it explains that some workers who work in offices experience musculoskeletal complaints in the workplace. Office is the place where administrative activities are carried out. Activities therein depend on the system between people, technology and procedures for handling data and information (Nuraida, 2014). Office work includes gathering, recording, processing, copying, sending and storing information orally and in writing and making written scripts needed in any collaborative effort. Such information can be in the form of data and information (Laksmi, 2015).

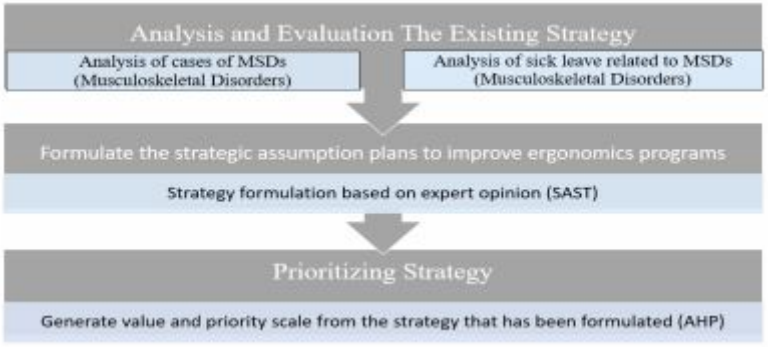
Atlas Injury Prevention (2017) in their research states that adjustments to seats, computer types, keyboard / mouse positions, and monitor positions are analyzed to determine the effect they have on employee's discomfort. They concluded that the proper use of an adjustable work height office setup can have a positive effect on productivity and back discomfort. Along with the correct use of an ergonomic chair that will support the lumbar spine, the height adjustment of the chair can be used to help reduce the level of low back pain in office layout settings.

II. RESEARCH METHODS

Types and approaches Research in this study the author uses this type of qualitative research The research method was conducted through qualitative descriptive using expert based approach (System of System Methodology - SoSM). Data analysis is utilizing SAST (Strategic Assumption Surfacing and Testing) method which was developed by Mason and Mitroff (1981) to formulate the strategy, and AHP (Analytical Hierarchy Process) developed by Saaty (1983) to prioritize the strategy. The data consists of primary and secondary data. The primary data obtained through observation, questionnaire and in-depth interview while the secondary data obtained through study literature and documents related to research material. The study began by analyzing data on MSDs cases and sick leave related to MSDs. The results of the analysis are taken into consideration when collecting assumptions of strategies for the office ergonomics program improvement and its level of importance and certainty through SAST. The assumptions of strategies are collected through a series of discussion, in-depth interviews with the experts in which end up with the point obtained of what the possibility assumptions are for strategy of office ergonomic program improvement.

Prioritizing strategic assumptions obtained from the SAST method is determined using the Analytic Hierarchy Process (AHP) method. AHP is used to solve a problem in an organized frame of thinking so that it can make effective decisions of problem solving and select the best choice according to the objective condition determined (Kholil, Susanti, & Soechayadi, 2016). According to Saaty (2008) in Kholil (2018), there are three principles in solving problems with AHP, namely the principle of compiling a hierarchy (Decomposition), the principle of determining priority (Comparative Judgment), and the principle of logical consistency (Logical Consistency). In this research, five experts from different expertise are involved with a series of discussion,

in-depth interviews using AHP questionnaire. The collected data were analyzed using Software Expert Choice 11.



Picture 1. Method of Research

III. RESULT AND DISCUSSION

The table below shows the data analysis of MSDs cases and sick leave related to MSDs within 3 years 2016 – 2018.

Table 1. Cases of MSDs within 3 years 2016 -2018

	2016	2017	2018	Total/Ratio
Total Respondent	93	83	89	265
Low Risk	20	31	31	83/31%
Medium Risk	63	41	49	153/58%
High Risk	10	11	9	30/11%
High Risk Ratio every year	10.7%	13.2%	10.1%	11.3%

The above table shows that MSDs are still found with an average annual rate of 11% for those categorized as high risk. While moderate risk amounts to 58% and low risk 31%.

Table 2. Sick leave data related to MSDs

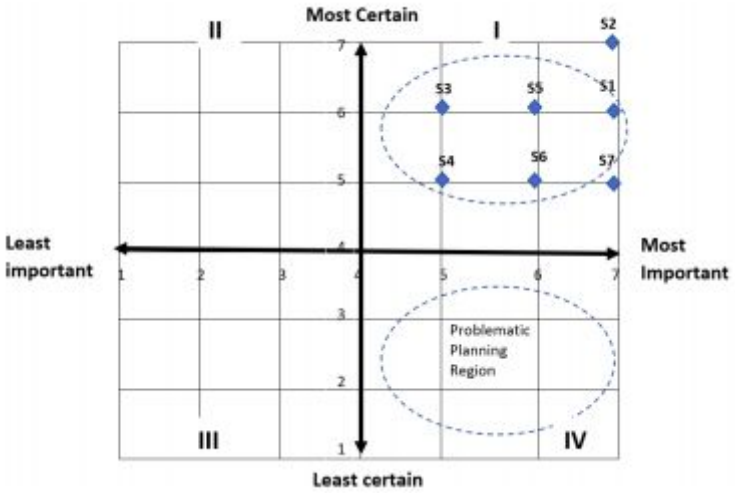
Sick leave data	2016	2017	2018	Total
Total days of Sick leave cumulative (all cases)	481	364	473	1318
Total days of sick leave related to MDSs cases	81	78	91	250
Ratio of sick leave days of MSDs to all cases	17%	21%	19%	19%

The above table shows cases of MSDs contributing around 20% per year to the number of sick days.

Results Analysis of MSDs cases and sick leave related to MSDs obtained from the previous research phase was taken into consideration to produce strategic assumptions. Strategic assumptions for office ergonomic programs improvement from each expert are summarized in the table below.

Table 3. SAST Weighting the strategic assumptions for office ergonomic programs

No	Asumsi	Penting	Pasti
S1	Work Station	7	6
S2	Policy and Procedure	7	7
S3	Health Check up	5	5
S4	Awareness Program	5	5
S5	Regular Exercise	6	6
S6	Training	6	5
S7	Supervision/Monitoring	7	5

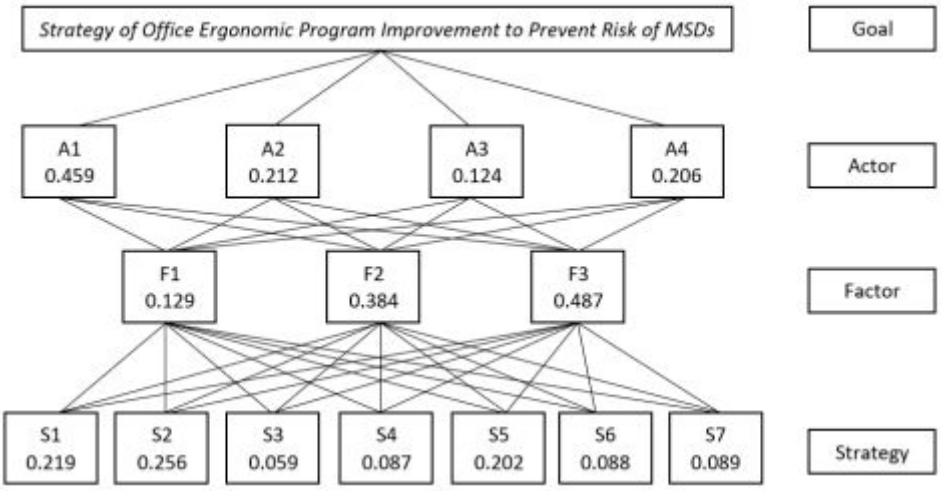


Picture 2. Ranking of strategic assumptions.

Assumptions in quadrant I are considered to have a high level of importance and certainty. This explains that the assumptions that have an optimal value with the value of the level of importance "very high" and the level of certainty "very certain" in accordance with needs. Assumptions spread in diagram I include S2 (Policy and Procedure) with the highest value (7.7), S1 (Work Station, 7.6), S7 (Supervision / Monitoring, 7.5), S5 (Regular Exercise, 6.6), S6 (Training /

special training on ergonomic office, 6.5), S3 (Health Check up, 5.5), S4 (Awareness Program, 5.5).

The AHP method involves five experts consisting of experts who have been in the field of work for more than twenty years. They work in the HSE field with their respective specialties such as safety specialists, industrial hygienists, occupational health specialists and environmental safety. Each expert filled out a questionnaire. The collected data are then analyzed using Expert Choice 11 software. The level of expertise can be seen from the Consistency Ratio (CR). The data used are data with CR values less than 0.10 as shown in the picture below.



Picture 3. AHP Hierarchy.

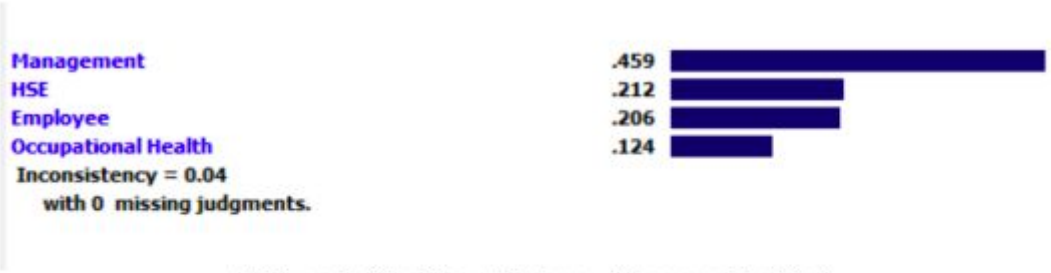
Note:

A1: Management, A2: HSE, A3: Occupational Health, A4: Emloyee,

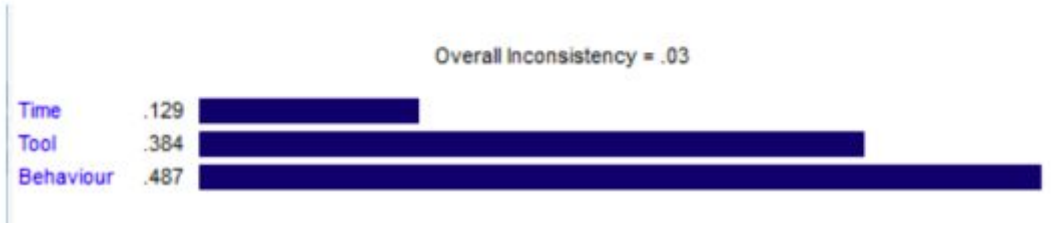
F1: Time, F2 : Tool, F3 : Behaviour,

S1 : Work Station, S2 : Policy and Procedure, S3 : Health Check up, S4 : Awareness Program, S5 : Regular Exercise, S6 : Training, S7 : Supervision/Monitoring.

Program, S5 : Regular Exercise, S6 : Training, S7 : Supervision/Monitoring.



Picture 4. Priorities of Actors with respect to Goal



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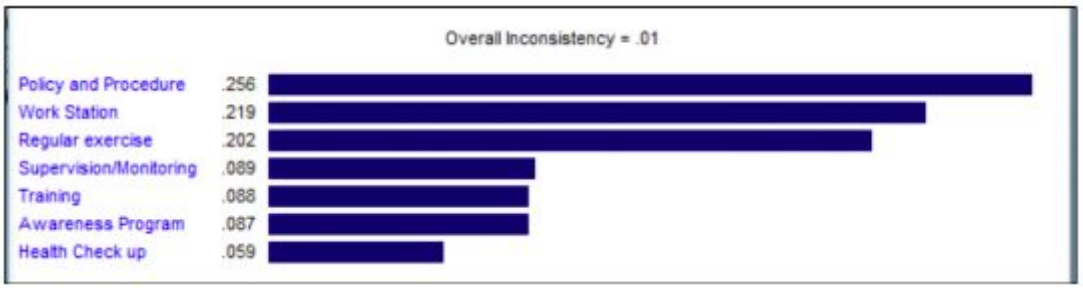
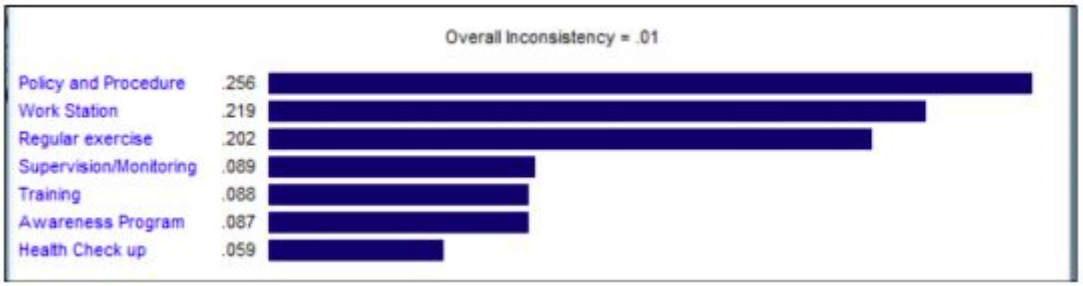


Picture 5. Priorities of Factors with respect to Goal.



Picture 6. Priorities of Strategies with respect to Goal.

The analysis shows that Management is the actor who has the most influential role in office ergonomic programs improvement. Management scored 0.459 compared to HSE 0.212, Occupational Health 0.124 and Employee 0.206.

Three factors have different analysis values. Behavior is a priority factor. This can be seen from the value of behavior analysis of 0.487 greater than 0.384 of tools and time (0.129). Behavior is the most priority factor in implementing the policy.

Policy and procedures of office ergonomics have the greatest value compared to other alternatives. Policy and procedure have the greatest value with 0.256, while workstation is 0.219,

health check-up 0.059, awareness program 0.087, regular exercise 0.202, training 0.088, supervision / monitoring 0.089.

IV. CONCLUSION

Based on the analysis of the existing ergonomics program, the data showed that the office ergonomics program still needs to be improved, marked by the presence of MSDs cases accompanied by quite high sick leave. In general, there are weaknesses in the ergonomics program where the program is only limited to appeals and general information so it is not binding on workers in implementing an office ergonomic program.

The results of the analysis show that Management is an actor priority, behavior is a factor priority and policy and procedure is a strategy priority. Based on this, management can focus on making and developing policy specifically for the ergonomic office program with consideration of existing worker behavior and the environment.

V. ACKNOWLEDGMENT

Based on the results of the research that has been carried out, it is expected that further research can formulate strategies for improving office ergonomic programs based on specific policies, workplace conditions, worker's culture and character, attitudes and behavior of workers and considerations of various ethnicities because workers come from various backgrounds and multinational so as to maximize the risk prevention for cases of health problems in general and MDSs in particular.

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