

**ERGONOMIC WORK SYSTEM AND
OCCUPATIONAL SAFETY AND HEALTH
PERFORMANCE: MEDIATING EFFECTS OF
PSYCHOSOCIAL WORK FACTORS**

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PSYCHOSOCIAL WORK FACTORS**

by

MOHD NASIR SELAMAT

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**SISTEM KERJA ERGONOMIK DAN PRESTASI KESELAMATAN DAN
KESIHATAN PEKERJAAN: KESAN PERANTARA FAKTOR KERJA
PSIKOSOSIAL**

ABSTRAK

Di Malaysia, pelbagai tindakan telah diambil untuk meningkatkan tahap kesedaran aspek keselamatan dan kesihatan pekerjaan (KKP) di tempat kerja. Namun, banyak kajian menunjukkan bahawa berlakunya masalah-masalah yang berkaitan aspek KKP adalah membimbangkan. Peningkatan berlaku kemalangan di tempat kerja, masalah ketidakhadiran, tinggi tahap tekanan dan kepelbagaian tahap kesihatan di tempat kerja menunjukkan bahawa tindakan perlu diambil segera. Kajian-kajian terdahulu menunjukkan terdapat perkaitan antara aspek ergonomik dan masalah KKP terutamanya dalam sektor pembuatan. Pelaksanaan aspek ergonomik boleh menjadi saluran untuk dipertimbangkan dalam menyelesaikan masalah-masalah KKP yang berkaitan di tempat kerja, yang akhirnya membantu untuk meningkatkan prestasi. Tersenarai di dalam sektor pembuatan, industri percetakan menunjukkan keterlibatan pekerja yang tinggi dengan masalah KKP dan kurang pelaksanaan terhadap aspek ergonomik. Dengan menggunakan konsep Balance Theory, kajian ini meneliti peranan sistem kerja ergonomik (SKE) terdiri daripada faktor permintaan kerja, faktor individu dan faktor organisasi (keterlibatan ergonomik), terhadap prestasi KKP. Di samping itu, faktor-faktor psikososial kerja, yang memberi tumpuan kepada aspek kuasa untuk membuat keputusan dan sokongan sosial, turut dikaji sebagai perantara antara SKE dan prestasi KKP. Kajian ini melibatkan seramai 295 responden dari beberapa syarikat percetakan di Malaysia untuk dikaji dan dianalisis. Hasil kajian menunjukkan bahawa

kebanyakan pekerja tidak mengetahui tentang isu-isu yang berkaitan ergonomik di tempat kerja. Hasil juga menunjukkan permintaan kuantiti memberi impak kepada semua indikator PKP. Umur memberi kesan kepada ketidakhadiran pekerja. Pengetahuan asas dan sokongan di tempat kerja sahaja yang berkaitan dengan keterlibatan ergonomik merupakan dua indikator yang memberi kesan ke atas PKP. Hasil kajian juga menunjukkan bahawa kuasa untuk membuat keputusan sendiri, menjadi perantara hubungan antara keterlibatan ergonomik (dimensi pengetahuan asas) dan tekanan pekerjaan dan penyakit, manakala aspek sokongan sosial tidak. Walaubagaimanapun, terdapat limitasi interaksi kecil antara dimensi SKE, kecuali interaksi antara permintaan sensorial, status kesihatan fizikal, sokongan tempat kerja dan umur individu terhadap stres pekerjaan. Hanya permintaan kuantiti dan keterlibatan ergonomik mempunyai hubungan terus dengan PKP. Permintaan sensorial, status kesihatan fizikal, dan umur individu akan berhubung dengan PKP apabila berlakunya interaksi. Hasil kajian menunjukkan bahawa pengurusan atasan, jawatankuasa keselamatan dan pekerja sendiri perlu bekerjasama bagi meningkatkan aspek KKP dan ergonomik di tempat kerja. Jumlah kerja yang diberikan kepada pekerja mampu memberi impak kepada aspek KKP di tempat kerja. Dengan kata lain, perubahan terhadap implimentasi aspek keselamatan di tempat kerja seperti mengubah keadaan dan persekitaran kerja, melaksanakan aspek ergonomik dan latihan KKP serta membudayakan aspek KKP, akan membantu untuk meningkatkan aspek keselamatan dan kesihatan para pekerja.

**ERGONOMIC WORK SYSTEM AND OCCUPATIONAL SAFETY AND
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ABSTRACT

In Malaysia, numerous actions have been taken to increase the level of awareness of Occupational Safety and Health (OSH) at work. However, various studies have shown that crucial safety and health-related problems are still prevalent. An increase in accidents at work, growing degree of absenteeism, as well as higher levels of sickness and stress at work seem to indicate that even more urgent action is required. Previous studies have also indicated that ergonomics plays a significant role with respect to OSH problems, especially in the manufacturing sector. The implementation of certain initiatives based on ergonomics might provide an avenue for solving, or at least alleviating, safety and health-related problems at work. This, in turn, would ultimately enhance workplace performance. Categorised as a manufacturing sector, the printing industry places high demands on its workers, which brings in OSH problems, and printing industry is yet to effectively implement adequate ergonomics initiatives. Using the concept of Balance Theory, this study examines the role of ergonomic work systems (EWS), as represented by job demand factors, individual factors and participatory ergonomics, in enhancing OSH performance. In addition, psychosocial work factors, which focus on decision authority and social support, were tested as mediators between EWS and OSH performance. Two hundred and ninety five respondents from several printing companies in Malaysia were surveyed and analysed. The findings showed that most of the workers were not aware of issues related to ergonomics at work. It was also

found that only quantitative demand affected all four of OSH performance indicators. Age affects absenteeism. The knowledge base and workplace support are the only two participatory ergonomics aspects that are related to OSH performance. The findings showed that decision authority mediates the association of a knowledge base and occupational stress as well as sickness, while social support does not. In addition, there is limited interaction between the dimensions of EWS, except for interactions between sensorial demands, physical health status, workplace support and individual age related to occupational stress. In short, only quantitative demand and participatory ergonomic have direct relationships with OSH performance. Sensorial demands, physical health status, and individual age are related to OSH performance only when they are in interactions. The findings imply that top management, safety committees and employees themselves should all collaborate in order to enhance OSH and ergonomics at the workplace. The amount of work given to the workers does have a significant impact toward the safety aspects at work. In other words, changes to the implementation of safety practices at work, such as altering work conditions and the working environment, implementing ergonomics aspects and OSH training, and inculcating a culture of safety will help to enhance the safety and health of workers.

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter discusses the basis of the proposed study. It includes the background of the study, research problems, and research objectives. The study discusses current concerns regarding Occupational Safety and Health (OSH) performance at Malaysian printing companies. Specifically, emphasis is directed towards having well-designed ergonomics to enhance work performance. The chapter ends by outlining the significance of the study, providing definitions of key terms found in it, and showing the organisation of the thesis.

1.2 Background to the Study

Providing healthy and safe working conditions is critical to at least twenty five percent of the Malaysian population, comprising over 28.9 million people (Malaysia Industrial Development Authority [MIDA], 2010). Approximately 990,102 of these workers are working in manufacturing industries where ergonomics is of prime concern (Department of Statistics Malaysia [DOSM], 2010). Several ergonomic aspects are involved in this, such as workstation design, the appropriateness of personal protection equipment, the suitability of tasks for workers, aspects of the physical working environment (lighting, humidity), and others.

However, previous studies have found that workers' major concerns regarding OSH are in fact related to the lack of attention given to the implementation of ergonomics (Anggela, 2000; Ayers & Kleiner, 2002; Carayon & Smith, 2000; Eveleens, 2003; Fernandez, 1995; Kawakami & Kogi 2005; Kerr, Mc-Hugh, &

McCrary, 2009; Shaliza, Sharul, Zalinda, & Mohzani, 2009; Shikdar & Sawaqed, 2003; Zafir et al., 2008). For example, a study on sickness and stress in the workplace of multinational companies in Malaysia found that there is a significant relationship between workstation design and coronary disease (Zafir et al., 2008). This might be due to a lack of awareness about ergonomic issues as well as the existence of limited resources for implementing ergonomics within allocated budgets. In conclusion, an ergonomic approach would enhance organisational health and ensure a safe working environment for the Malaysian workforce.

Previous studies have consistently shown that a prevalence of sickness and stress, as well as a vulnerability to accidents for workers in the workplace can largely be ascribed to a lack attention being placed on OSH aspects (Ahmadon, Rosli, Saidin, & Abdul-Halim, 2006; Carayon, 2000; Shikhdar & Sawaqed, 2004). A study carried out by Zafir et al. (2008) found that poor lighting, inappropriate or inadequate tools and equipment, combined with rigid working hours influence workers' performance, potentially resulting in workers feeling stressed and, therefore, having lower levels of satisfaction. Furthermore, Shaliza et al. (2009), and Shikdar and Sawaqed (2003) found that jobs or tasks that are not suitable to workers' skill sets also contribute to poorer performance and productivity. This is all related to ergonomics and aspects of OSH. A study by Loo and Richardson (2012) found that ergonomics could help to improve performance while also enhancing workplace safety and health. Additionally, many companies believe that ergonomics plays an important role as a part of OSH that focuses mainly on the reduction of risks and hazards (Hermans & Petegham, 2006). In short, aspects of OSH at the workplace, with specific reference to ergonomics, affect the performance of workers as well as organisational performance as a whole.

Additionally, poor working conditions are also shown to result in innumerable back injuries, stress, and the occurrence of accidents (Noblet & Lamontagne, 2006; Saad, Said & Abdul-Halim, 2012; Salleh, Bakar & Keong, 2008; Yahaya et al., 2010; Zakaria, Mansor, & Abdullah, 2012). For instance, in Malaysia, the number of workers involved in workplace/work-related accidents in manufacturing was the highest, with 16,145 cases, followed by construction and trading, with 5,908 and 5,397 cases, respectively (Social Security Organisation [SOCISO], 2013). An empirical report by SOCISO (2013) showed that more than 1000 cases of accidents were due to working environment factors such as bad working surfaces and poor floor conditions, which are considered part of basic ergonomics. Therefore, a demand for effective ergonomic elements, including workplace design, working environment and machine systems, is important in the context of OSH in that it may significantly reduce the occurrence of accidents in the workplace.

Ergonomics deals with the application of knowledge about human behaviour, capabilities, and limitations to the design of systems, machines, tools, tasks or jobs and environments for constructive, safe, and effective human use (Ashraf, Saedd Al-Araimi, & Bill, 2002; Carayon, 2009; Shaliza et al., 2009). Others define ergonomics as the science of designing the job to fit the worker, instead of forcing the worker to fit the job (Carayon & Smith, 2000; Jalaluddin, 2007; Occupational Safety & Health Act [OSHA], 1994; Rowan & Wright, 1994; Zafir et al., 2008). In addition, the Chairman of the National Institute of Safety and Health of Malaysia (NIOSH), Tan Sri Lee Lam Thye, has pointed out that ergonomics refers to the science and technology that creates user-friendly tools for work, design, and the workplace environment which meet the physical and psychological requirements of workers

(Berita Harian on November 26, 2008). Ergonomics also emphasises the pivotal trio of elements essential for the workplace environment, namely: comfort, health, and productivity (Fernandez, 1995; Helander, 1997; Parsons, 2000). Thus, with the application of ergonomics in the workplace, jobs are made safer through the prevention of injury and illness, operations are facilitated by enhancing the comfort of workers, and tasks are made more pleasant by alleviating physical and mental stress, all of which will eventually lead to improved worker and organisational performance (J-Singh, 2009; Yahaya et al., 2010).

However, the application of ergonomics in the workplace in Malaysia is still lacking (Ganesh et al., 2010; Kawakami & Kogi, 2005; Loo & Rihardson, 2012; Mahmud, Kenny, Md-Zein & Hassan, 2015; Rozlina et al., 2012; Sandra, Beach, Aw, & Sheikh- Ahmed, 2001; Shaliza et al., 2009; Vijay, Richardson, & Sen, 2006; Yeow & Rabindra, 2003; Zafir & Durishah, 2009; Zafir et al., 2008; Zafir, Nor-Liza & Zizah, 2013). For example, Shaliza et al. (2009) found that less than 40% of Malaysian manufacturing companies have a high level of ergonomics awareness, and only 33% of the manufacturing companies have implemented ergonomics programs at work. Meanwhile, several Malaysian studies reported that the implementation of elements of ergonomics in the workplace is needed to enhance OSH (Mahmud et al., 2015; Rozlina et al., 2012; Vijay et al., 2006; Zafir et al., 2013). In light of this, it is essential that ergonomics at work is treated seriously, as a way of avoiding OSH problems.

Poor ergonomic designs, on top of a lack of training, participation and social support, all serve to increase the chance of workers becoming stressed and sick (Melamed, Luz, Najenson, Jucha, & Green, 2008). For example, organisations whose employees are highly committed and participate in ergonomics issues are more likely

to have a stable, productive and safe workforce, in turn lowering the prevalence of stress (Lowe, Schellenberg & Shannon, 2003; Matthews, Gallus, & Henning, 2011). This, in turn, decreases the likelihood of accidents occurring in the workplace, and also reduces absenteeism rates, thereby ultimately optimising worker performance (Selamat & Surlenty, 2012). It is clear, therefore, that ergonomics plays a meaningful role in enhancing worker safety, and as a result, performance at the workplace.

The application of proper ergonomics in the workplace has a direct impact on an organisation's OSH performance, while a lack of ergonomics means the organisation is likely to suffer in terms of productivity and might eventually have to downsize its human capital.

While ergonomics is clearly a vital workplace issue, studies on the matter are extremely limited, particularly when it comes to printing companies (Aziah, 2003; Gundega, Janis, Zenija, Valdis, & Henrijs, 2014). Therefore, an attempt to investigate the relationship between aspects of ergonomic and OSH performance in printing companies would unquestionably contribute some significant insights and would add to the current body of knowledge in the field of ergonomics.

1.3 The Printing Industry

Categorised under manufacturing, the printing industry is one of the oldest production industries, having been in existence since 1887. In the last 500 years, printers have been developed to meet standards and practices by improving tools, equipment, technology, and other aspects (Wesley, 2010). According to the International Ergonomics Association (IEA) 2000, the printing industry is the sixth largest industry in the United Kingdom. Approximately 316,000 workers are employed in over 15,000 printing companies. In Malaysia, the printing industry is

registered with the Ministry of Home Affairs. There are 3,162 printing companies in this country (MIDA, 2002), making it the fifth largest industry in the manufacturing sector (Aziah, 2003), with 47,102 workers (DOSM, 2006) and increase 13 percent in year 2014. These figures clearly illustrate the significance of the printing industry to the nation, thus making the current study a meaningful research endeavour.

The printing industry in Malaysia plays a critical role as both an enabler and a catalyst for education, communication, and the dissemination of knowledge and information. Even though the current state of communication technology allows for dispensing the need for hardcopies, this is not the case in Malaysia, as current media technology has not yet reached its full potential and capacity. This is particularly true in terms of the dissemination of information through the use of newspapers, magazines, academic references and textbooks, exam papers, and others (Malaysia Printing & Supporting Industries Directory, 2011/2012). Indeed, if the demand for printing hardcopies is reduced, then more work will be needed to protect the welfare of those employed in this sector.

The importance of the printing industry can be seen by referring to the figure indicating the total investment approved in 2011 by MIDA (2011) for the paper, printing, publishing industry, which amounted to RM 533.6 million. This amount encompassed 37 projects, including transformation projects which are very capital intensive and whose cost is still growing (MIDA, 2011). The amount reflected an expansion in local and international investment that contributed around 1.3 percent to Malaysia's gross domestic product (GDP) from its manufacturing sector of RM 56.1 billion in 2011. These figures show that the printing industry still has a significant contribution to make to Malaysian economic development, offering work opportunities to a large number of people in society (MIDA, 2011).

However, workers in the printing industry still suffer several problems. Unsuitable working environment for workers, including poor workstation designs and heavy workloads, affect the ability of workers to perform as productively as possible. Workers risk getting injured or being involved in accidents at work. However, recent studies have shown that the issue of safety while conducting tasks and work in the printing industry is receiving attention, as is the implementation of ergonomic concepts in the workplace. These seek to address the possibility of workers developing OSH related problems, such as back pain, accidents and hazardous exposure (Aziah, 2003; Gundega et al., 2014).

Accidents in the workplace were found to be a major problem in the printing industry (SOCSO Annual report, 2010; Harry, Vivienne, Wayne, et al., 1998). Health Service Executive (HSE), located in United Kingdom, notes that printing companies reported approximately 1,200 work related accidents in 2012/2013 (HSE, UK, 2012/2013). Over 60 percent of these accidents were classified as major injuries, such as fractures and amputations. The three most common types of accidents reported are manual handling, slips and trips, and contact with machinery due to a lack of attention given to ergonomic aspects (Healy & Stacey, 2006; HSE, UK, 2012/2013). It is thus clear to see that accidents at work are a major safety concern in printing companies, and should be taken seriously by taking preventive measures including the implementation of aspects of ergonomics.

In addition, with respect to the nature of work in the printing industry, poor working environments, as well as the poor conditions of machines, lifting equipment and materials, were cited as factors that lead to accidents in the workplace (SOCSO, 2010). Production line workers have to handle heavy materials and equipment, use body force, do repetitive tasks, work in awkward or cramped positions, stand and sit

for long hours. Furthermore, they are exposed to body overheating, extreme vibration and harmful noise, among other things. Continuous and prolonged exposure to these conditions harms workers' health and safety due to ergonomic risks as reported by HSE, UK, (2010), and the Printing Industry Advisory Committee, PIAC, UK, (2006). Consequently, organisations will encounter a decline in workers' performance, including an increase in absenteeism rates and a reduction in workers' health levels.

Moreover, in the printing industry, production workers are tending to have greater work demands placed on them. Some of the physically demanding tasks undertaken by workers include masking film and exposing plates, operating power tools, tending to machines, loading and unloading materials, as well as mixing and placing ink, alcohol, water, paper and gummer (Aziah, 2003). These activities expose workers to ergonomic risk factors, such as awkward posture, frequent heavy lifting, repetitive motions, and hand/arm and whole body vibration. Furthermore, greater work demands can affect workers' psychological health and physical health such as stress, sickness and were influence to not attend to work. In addition, changing time arrangements, differing work schedules (day work versus various types of shift work), inconsistent working hours, and overtime can also negatively influence the health performance of workers (Niu, 2010). Significantly, these conditions are prevalent in printing companies in Malaysia, where there is an ever increasing demand for more work and abilities on the part of employees (Aziah, 2003).

Most companies in the printing industry in Malaysia have no specific provisions for ergonomics programs at work. Nonetheless, many of these companies conduct programs related to safety and health, which can be considered to be associated with ergonomics, such as campaigns promoting the wearing of personal

protective equipment, providing safety training, and implement continuous checking routines for all machines before, during and after use. The relative lack of emphasis on ergonomics can be ascribed to limitations of knowledge and awareness regarding this issue, as well as the cost of implementing ergonomics programs in printing companies. In light of this, more effort is required to promote ergonomics concepts and practices in various industries in Malaysia, including the printing industry (Loo & Richardson, 2012).

In Malaysia, total accidents in the printing industry were reported to have increased from 2009 to 2010, with 569 and 608 cases respectively, reflecting a high rate of accident caseloads in those years (SOCSO, 2010). Meanwhile, Table 1.1 shows the total number of accidents in the printing industry for the years 2010 to 2013. After a dip in 2011 and 2012, 2013 saw a rise in accident cases in the printing industry, up from 569 cases the previous year to 644 (SOCSO, 2013). Furthermore, in line with the increased work demands involved in the printing industry, it can be extrapolated that more accidents occurred due to ergonomics related factors such as falls, being struck by falling objects, stepping on hot surfaces and exposure to or contact with extreme temperature. For example, the accident happens such as slippery, broken arm and hand, as well as headache. This may be due to shoes of workers, the inappropriate design of the work station and other factors. In the manufacturing industry as a whole in 2013, there were 16,561 accidents associated with falls and 5,078 associated with being struck by falling objects (SOCSO, 2014). These cases led to an increase in the amount of compensation payment in the industry, which of course impacts on companies' bottom lines.

Table 1.1

Total Accidents in the Manufacturing Industry

Industry/Years	2010	2011	2012	2013
Manufacture of rubber products	412	405	373	354
Manufacture of printing products	608	598	569	644
Manufacture of food products not classified elsewhere	512	548	618	522
Manufacture of chemical products	287	230	206	248
Manufacture of glass and glass products	159	149	145	130

Notes: *Taken from the Schedule of Statistics of Industrial Accidents in Malaysia*

Sources; *Annual Report SOCSO (2013)*

The Department of Occupational Safety & Health (DOSH) reported that each year the payment of compensation for accidents in Malaysia was extremely high, at an average of RM 1.2 billion (DOSH, 2010). This figure derived from more than 55,000 accident cases, including more than 1,000 fatal accidents in the manufacturing industry (DOSH, 2010).

With all this in mind, the printing industry in Malaysia has the incentive as well as the potential to adapt to recent technological developments (Malaysian Printing Association [MPA] News, 2004). Thus, what the printing industry needs to do is to improve its performance through applying new technology which can contribute to higher profits while also enhancing client satisfaction. Moreover, the printing industry is also moving away from commercial printing companies to standard office operations using high technology machines. This means that activities in the printing industry will not focus on printing itself, but on offering other activities and services. This would involve, for example, providing a total service for clients in print and information management from creation to delivery, developing a digital data repurposing service and providing an internet based service. All this means that the work demands and burdens of workers are likely to increase, thereby

affecting their health and social circumstances. This could exacerbate the occurrence of OSH problems.

The printing industry needs to be aware of this as well as newly emerging worker safety issues, which can affect performance. Improvements in working conditions and innovations in the equipment used in all industries, including the printing industry, are not enough to improve safety performance because organisational culture and human factors also play critical roles (Zhou et al., 2008). There is no specific program designed for printing industry. There were only a few programs related to safety and health conducted being conducted such as campaign to wear personal protective equipment, safety training, simulation of work task, implementation of the routine of double checking each machines before, during and after used. There were a few reasons that discouraged printing companies from implementing ergonomics programmes: Moreover, due to: (1) the limitations of knowledge on ergonomic; (2) lack of and awareness regarding the importance of ergonomics aspect; and (3) limited funding as well as the cost budgeting to implement ergonomics programme in the printing companies shows the common reasons of ergonomic were not implemented.

In this respect, efforts aimed at the prevention of OSH problems in the workplace are taking safety issues into account more and more. In view of this, this study attempts to look at health and safety issues which are crucial in the printing industry, also attempts to identify OSH performance issues.

In conclusion, even though many previous studies have looked into aspects of ergonomics in the workplace, this study aims to focus on behavioural issues in printing companies, rather than technical and mechanical ones. This study emphasises the importance of exploring and investigating the problems faced by

printing companies in relation to ergonomics and OSH aspects. The findings, meanwhile, concern the interactions of EWS in assisting to achieve the main purpose of the study whilst also contributing to the enhancement of worker performance.

1.4 Problem Statement

Work performance can be improved by aligning what the workers need from their work environment with what is supplied by the workplace (Edward & Harrison, 1993). Workers' performance refers to people's best abilities in performing a job or task (Heathfield, 2011) and is related to the behavioural outcome of the individual (Grant & Parker, 2009). In other words, workers' performance is also considered as workers' outcome, which refers to the consequences of individual performance (Sabine & Michael, 2002). Therefore, it is necessary to promote and maintain the highest degree of physical, mental, and social well-being of individuals in all occupations to ensure their performance at work (Archer, Borthwick & Tepe, 2009).

Overlooking the importance of maintaining workers' health and social well-being at work will lead to numerous problems to both the individuals as well as the organisation. Specifically, this may lead to a loss of workers' talents and a decrease in organisational performance.

At an individual level, low levels of health outcomes may affect not only one's own quality of life but also relationships with others. For instance, generalised mental depression will lower a person's normal capability to perform but may also drive away friends and family because of the negative response you may give out due to the depression (Long, 1995; Niedhammer, Chastang & David, 2008). A recent study on health and wellness in six Asian countries, including Malaysia, found that 48% out of 532 Malaysian respondents suffered from some minor health issue, while

30% of Malaysian women and 7% percent of Malaysian men had major health issues (New Strait Times, September 20, 2015). These issues may eventually result in other social ills in the long run. In addition to illnesses, absenteeism, stress at work, involvement in accidents, coronary disease, and excessive workload all affect individual performance (Kudielk et al., 2004; Linton & Hallden, 1998; Zafir et al., 2008; Zakaria et al., 2012). Down the line, they are also sure to affect the qualities and productivity of individuals.

Further to this, companies with the greatest health problems, poor facilities, environmental problems as well as poor working environments will see a decline in their employees' work performance (Ismail, Rani, Makhbul, Ghani, Nuawi, & Zulkifli, 2008; Leigh, 1991), adding over time to organisational costs.

In addition, at the organisation level, poor standards of occupational safety and health can incur higher operational costs. For instance, work-related accidents and injuries significantly affect the cost of insurance premiums paid by companies (Shan, 2011; Yakubu & Bakri, 2013; Zakaria et al., 2012). The cost of workers' medical benefits increases with a high incidence of accidents and injuries, eventually adding to the administrative costs of an organisation by way of the insurance premium having to be paid by companies (Ayers & Kleiner, 2002; Carayon & Smith, 2000). Unhealthy and unsafe workplaces also result in increases to medical bills. Moreover, in Malaysia, the continuing nature of such problems affects SOCSO, the main institution that provides social security coverage, leading to higher compensation pay outs and higher administration costs (SOCSO, 2013).

Additionally, problems also occur as a result of a lack of attention to PWF, which contributes to the likelihood of workers getting involved in accidents, as well as experiencing stress, absence from work, depression and fatigue (Annalisa,

Isabelle, Els, & France, 2013; Bartram, Yadegarfar, & Baldwin, 2009; Bonde, 2008). Work ineffectiveness, working discomfort, health problems and OSH problems can be influenced by PWF (Rugulies, Christensen, Borritz, et al., 2007; Larsman & Hanse, 2009) which eventually affects workers' well-being. Therefore, in an effort to prevent safety and health-related problems through an ergonomic approach in the workplace, due attention should also be given to PWF (Devereux, Buckle, & Vlachonikolis, 1999).

Based on the currently available literature, only a limited number of studies have been carried out on the dimensions of EWS as a stimulus to OSH performance in Malaysia. In addition, little effort has been spent clarifying the concept of OSH performance in the workplace (Sabine & Michael, 2002; Ahmadon et al., 2006). It is important to show that OSH issues actually convey significant insight into humanitarian considerations, financial costs, and legal sanctions (Bateman, King, & Lewis, 1994). Additionally, the issue of ergonomics in the workplace needs further attention, complementing the fact that safety should be a prime concern in any industry (Ahmadon et al., 2006; Mahmud et al., 2013; Rozlina et al., 2012). PWF, meanwhile, should also be prioritised in order to facilitate workers' well-being through a healthy and harmonious working environment. This also pertains to printing companies, which are capital-intensive endeavours.

It is clear that further discussion on the issues is needed, with the aim of answering whether EWS leads to OSH performance in Malaysian printing companies? Other questions to be considered include how the interaction of EWS affects OSH performance, and how PWF mediates the direct relationship between the study variables in Malaysian printing companies?

1.5 Research Objectives

The aim of this study is specifically:

1. To investigate the effect of ergonomic work systems (Task Factors, Individual Factors & Participatory Ergonomics) on occupational safety and health performance (Absenteeism, Sickness, Occupational Stress & Occupational Accidents).
2. To investigate the effect of psychosocial work factors (Decision Authority & Social Support) on occupational safety and health performance.
3. To investigate the interaction effects of ergonomic work systems in determining occupational safety and health performance.
4. To investigate the mediating effects of psychosocial work factors on the relationship between ergonomic work systems and occupational safety and health performance.

1.6 Research Questions

This study will attempt to answer the following research questions:

1. Do ergonomic work systems affect occupational safety and health performance?
2. Do psychosocial work factors influence occupational safety and health performance?
3. Do the interaction effects of ergonomic work systems relate to occupational safety and health performance?
4. How do psychosocial work factors mediate the relationship between ergonomic work systems and occupational safety and health performance?

1.7 Significance of the Study

The present study intends to look at the relationship between EWS and OSH performance while also examining the mediating effects of PWF. This is a valid area of research, given that there are only a limited number of studies investigating EWS aspects in Malaysia. The study will invariably lead to new theoretical and practical contributions, such as the following.

1.7.1 Theoretical Contribution

Balance theory was developed and is used to address job-design issues and the impact of work on the well-being and outcomes of individuals. Balance theory has been expanded to keep pace with current challenges at the workplace. The theory proposes the need to redesign and improve jobs. Other models and theories are mainly concerned with the elements of work systems without giving much consideration to other prevailing aspects, including all the dimensions of EWS, such as individuals, tasks, and participatory ergonomics. Therefore, this study seeks to examine the three elements of the EWS oriented towards health outcome. As such, a further application of balance theory on these specific aspects represents the theoretical contribution of this study.

The research also seeks to test the components of EWS working together, which - to the best of the researcher's knowledge - has rarely been studied, especially in Malaysia. Thus, it may well be the first study of its kind to perform this type of analysis.

It is hoped that a study on the interaction of elements of EWS will give rise to some new knowledge, as past studies on this matter are very rare. The study could

also enhance balance theory by confirming that the interaction of elements of EWS affects OSH performance.

In addition, more specifically, the study intends to explore several indicators of PWF dimensions, such as decision authority and social support, which are not clearly elaborated upon in the balance theory. The unambiguity of these dimensions may expand previous theories and confirm that aspects of PWF are important, while clarifying the nature of the relationship between EWS and OSH performance. Also, the mediating effects of PWF dimensions will enhance the current theory of EWS on OSH performance. The study seeks to provide empirical evidence through an examination of this relationship. Moreover, a detailed expansion of theoretical indicators through the clarification of PWF concepts will convey specific insights into the contents of current theory, thereby providing a valuable contribution to the current body of knowledge.

The study aims to expand the body of academic knowledge in measuring OSH performance. Previous theory has shown three indicators - absenteeism, sickness, and occupational stress - as the major components of workers' outcomes. However, it is occupational accidents that have been found to be the most important measure of OSH performance (Ahmadon et al., 2006; Archer et al., 2005; Laitinen & Vahapassi, 1992). Therefore, this study intends to include occupational accidents as another indicator of OSH performance, as this has yet to be done. In addition, the study will extend the traditional theory by integrating a new element into measuring safety as part of balance theory. In turn, this will enable workers and organisations alike to carry out their work more accurately, while improving safety at the workplace by preventing injuries and near accidents.

1.7.2 Practical Contribution

This study hopes to impart an understanding of the practical implementation of OSH at the workplace in the Malaysian context. In Malaysia, priority should be given to evaluating the applications of OSH in the workplace, as this is still rare.

A major concern of this study is to refer to the multiple interactions of the different dimensions of EWS, as a way of giving managers an indication as to the importance of different factors as opposed to a single factor in determining OSH performance. This could help managers in organising work processes and assist them in making good decisions on work-related issues.

Furthermore, this study also touches on social support as an important indicator in creating a good working environment at the workplace (Wameedh, Faridahwati, & Chandrakantan, 2011). A good social relationship between workers and superiors (supervisors or managers) brings about a feeling of camaraderie amongst workers and lessens stress, which in turn promotes good working conditions at the workplace. As researcher knows, stress at work is unavoidable but it is important to understand how to manage it well. Therefore, as mentioned earlier, managers should make an effort to develop good relationships through good communication (verbal or non-verbal) and support one another to work hard.

Furthermore, the findings of this study may provide insights leading to improvements at the workplace by reducing workloads, introducing good shift work arrangements, providing participatory ergonomics programs, ensuring good health practices, and creating good relationships between supervisors and employees. More specifically, the interaction between these factors could provide input to the organisation in order for it to come out with good work plans and work arrangements. For example, listening to a variety of opinions and ideas of workers on

the arrangement of office workstations could result in their being more comfortable and less pressured while performing their work. Meanwhile, the development of worker committees in an organisation could prove to be a good approach for getting workers involved in all the organisation's activities.

Most importantly, the findings of this study aim to inspire organisations to improve the performance of their human resources by creating a favourable workplace and an efficient work system, as well as by taking into account relevant psychosocial aspects. For example, the findings could assist in determining whether decision-making by employees and employers is important to managing OSH, especially as this relates to aspects of ergonomics. To the best of the researcher's knowledge, this is among the first studies in Malaysia to investigate the role of ergonomics in managing OSH aspects at work.

As mentioned earlier, managers play a pivotal role in providing good ergonomics for their subordinates while they carry out their work. Moreover, continuous intervention programs at the workplace reduce workers' stress and promote good health, thereby improving quality of life. In this way, human resource practitioners are made to understand how work designs influence employee well-being and performance. This, in turn, will lead to increased investment in manufacturing, especially in printing companies at the national and international level, thus also improving Malaysia's national income.

1.8 Operational Definitions of Key Terms

This section will discuss the conceptual and operational definitions of the study variables. The conceptual definitions are derived from experts in this area of study.

The operational definitions refer to the definitions to be used as appropriate to the context of this study.

1.8.1 Ergonomics

Ergonomics is defined as an adaptation to a job or workplace by the design of tasks, workstations, tools, and equipment that are within a worker's physical capabilities and limitations (Schwind, 1995). Attwood et al. (2004) described ergonomics as the systematic process designed for human use through the application of our knowledge of human beings to the equipment they use, the environment in which they operate, the tasks they perform, and the management systems that guide the safety and efficiency of the operations in refineries, chemical plants, upstream operations and distribution terminals. Additionally, ergonomics refers to the science of dealing with interactions among humans and their activities, equipment, environment, and systems (Archer et al., 2009).

The aim of ergonomics is to improve system performance by improving interactions between human-machines (Archer et al., 2009; Armstrong, 1993; Bridger, 2003). The current study utilises the definition used by Eric and Curt (2008), which refers to ergonomics as systematic applications and limitations to the design of systems with the goal of optimising the interactions between people and other system elements to enhance safety, performance, and satisfaction. This definition is in line with that of Smith and Carayon (1989), which makes the assertion that the work system model and balance theory should be considered as aspects of ergonomics.

1.8.2 Ergonomic Work Systems

An ergonomic work system provides a way of describing all of the elements of work that affect workers and outcomes. Focusing on behavioural aspects, a work system refers to the elements of task factors, individual factors, and organisational factors (Carayon, 2009; Smith & Carayon, 1989). Work system models concern tasks performed by an individual using tools and technologies, as well as tasks performed in a physical environment and under organisational conditions (Smith & Carayon, 1989). Some further definitions are elaborated on below.

1.8.2(a) Task Factors

According to balance theory, task factors are psychosocial work factors which fall into task elements, such as job demand, job control, and job content (Smith & Carayon, 1989). In this study, task factors refer to task demand factors, as outlined by Carayon (2009), which concern three elements referring to quantitative demand (the quantities and capacities that workers will encounter while doing their work), sensorial demand (the concentration and sense of workers in their work activities), and emotional demand (the emotions and feelings of workers while conducting their work).

1.8.2(b) Individual Factors

Carayon and Smith (2000) state that a number of personal considerations determine the physiological and psychological responses that the preceding elements of the work system model will produce. In this study, individual factors focus on the physical health status of workers as well as the two individual background factors of

age and length of service in the area of the job. These three elements can be represented as physiological and psychological (Wojtek et al., 1987).

1.8.2(c) Organisational Factors

Many organisational factors may affect and influence workers' motivation, stress, and performance. Several elements are used in measuring organisational factors as a predictor to outcomes. Training programs, development projects, the implementation of new technology, career development, work schedules, and overtime work can be considered as factors that may influence worker performance. However, in this study, organisational factors focus on participatory ergonomics at work, which includes self-involvement (the feeling of wanting to be involved with aspects of ergonomics), knowledge base (the knowledge of ergonomic aspects of ergonomics), managerial support (organisational sustaining of aspects of ergonomics), employee supportiveness (encouragement to implement aspects of ergonomics), and strain (rejection of aspects of ergonomics), (Matthew et al., 2011).

1.8.3 Psychosocial Work Factors

PWF work can be described as how workers and managers perceive work organisation (Toomingasm, Michelsen, Nordemar, & Stockholm, 2008). Karasek and Theorell (1990), and Johnson and Hall (2006) described PWF exposure conditions as including mental demands, levels of control, and social support at work. In this study, the definition of PWF includes decision authority and social support, both of which have been shown to potentially affect individual performance (Devereux et al., 2009, Willemsea et al., 2012).

1.8.3 (a) Decision Authority

Decision authority refers to the authority to make decisions and the opportunity to use the skills that an individual has acquired (Kuper & Marmot, 2003; Mikkelsen, Saksvik, Eriksen, & Ursin, 1999).

1.8.3 (b) Social Support

Social support refers to the social relationship between employers and employees, as well as the relationship amongst employees at the workplace and extending to their families. Particular focus is given to insufficient levels of social support and the quality of relationships between employers and employees (Devereux, Buckle, & Vlachonikolis, 1999; Ingrid, 2009; Larsman & Hense, 2009; Zakerian & Subramaniam, 2009).

1.8.4 OSH Performance

Performance refers to the achievements of employees while conducting their work in good conditions. It also depends on an employee's ability to perform under simulated conditions (Spector, 2008). It refers to behavioural aspects that contribute outcomes to organisations (Cambell, McCloy, Oppler, & Sager, 1993), which are not defined by actions themselves, but rather by an adjudicative and evaluative process (Motowidlo, Borman, & Schmit, 1997). OSH refers to acts of making further provisions for securing the safety, health and welfare of persons at work, and for protecting others against risks to their safety or health in relation to the activities of persons at work (OSHA, 2010).

The purpose of OSH is to establish the National Council for Occupational Safety and Health and for matters connected therewith (OSHA, 2010). In other

words, it means promoting and maintaining the highest degree of physical, mental, and social well-being of workers in all occupations (Archer et al., 2005). The current study defines OSH performance as the preservation and protection of individual workers and facility resources at the workplace including social, mental, physical, and well-being aspects (Kohn, Friend, & Winterberger, 1996). OSH also focuses on preventing the occurrence of various safety and health-related problems including: absenteeism, sickness, occupational stress and occupational accidents, as elaborated upon below.

1.8.4 (a) Absenteeism

According to Lambert (2001) and Michie, Wren, Williams, et al. (2004), absenteeism can be defined as voluntary non-attendance at work, without valid reason. Absenteeism means either habitual evasion of work, or wilful absence as in a strike action. Absenteeism can also be defined as non-attendance of employees for scheduled work when they are expected to attend (Huczynski & Fitzpatrick, 1989). For the purpose of this study, absenteeism focuses on the following reasons for non-attendance – sickness, family matters, organisation problems, and hidden reasons (no valid reason).

1.8.4 (b) Sickness

Sickness refers to debilitating symptoms displayed or experienced by a person, such as depression, anxiety and other physical or psychological disorders (Kerstin et al., 2005). This study defines sickness as unfavourable conditions that affect an individual physically, physiologically and psychologically (Zafir et al., 2008).