

ICE & ICIE 2019  
4th International Conference on Ergonomics  
&  
2nd International Conference on Industrial  
Engineering

Book of Abstracts

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# About

The *4th International Conference on Ergonomics 2nd International Conference on Industrial Engineering* (ICE & ICIE 2019) aims to provide a platform for the presentation of new advances and research work in the fields of ergonomics and industrial engineering. The conference will bring together researchers, engineers and scientists in the area of interest from around the world. Researchers from academia and Industry are invited to present their work and innovation. Full papers relating to broad areas of Ergonomics and Industrial Engineering are invited to this conference.

All accepted papers will be published in one of the following journals:

1. Ingeniería e Investigación (ISI/Web of Science)
2. Journal of Engineering Research (ISI/Web of Science)
3. Journal of Mechanical Engineering and Science (JMES) (SCOPUS)
4. Malaysian Journal of Public Health Medicine (MJPHM) (SCOPUS)
5. IOP Conference Series : Materials Science and Engineering (SCOPUS)



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# Accepted Papers

## **Robotic-based Model for Slow Learners Learning**

Nurul Husna Mukhtar<sup>1</sup>, Wan Fatimah Wan Ahmad<sup>1</sup>, Ahmad Sobri Hashim<sup>1</sup> and Manisah Mohd. Ali <sup>2</sup>

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**Keywords:** Slow learner, student-centred learning, robotic.

Learning is important for the development of children with special needs. Slow learners, which are included in the special needs category suffer from extreme timidity thus making them unable to actively involved in learning sessions. The objective of this study is to identify the existing models and theories through literature reviews and interview. This study involves two phases of activities which are; Phase 1, identification specification through literature review and expert interview, and Phase 2, model development. Based on the review, a robotic-based model for slow learners learning is proposed. The model is derived from Care-Receiving Robot, Social Development Theory and Triple-D Model which consists of the teacher (More Knowledgeable Other), the student, the robot (Care-Receiving Robot), learning by teaching to invoke student-centred learning, and evaluation (Triple-D Model). The proposed model can serve as the basic model for the development of robotic applications in education especially in special education.

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## **Consequences of Performance Management and Accident in Malaysia Construction Safety**

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Reported fatal accident in Malaysia construction industry contributed the highest number among other industries since 2009 until 2018. This statistics is alarming and elucidate the needs to conduct a scientific research to find the solution to solve the problem. Safety and health issues remain critical to the construction industry due to its working environment and the complexity of working practises. In order

to prevent an accident, hazard identification is fundamental to construction safety management because unidentified hazards present the most unmanageable risks. Therefore, this research is conducted with the aim to help in reducing occupational accidents in the construction industry and it can be considered worthy. The aim of this study is to understand the triggering events and their factors leading to fatal accidents are of important input. The obtained data was analysed using statistical analysis program. Data collection of 139 numbers of respondent have been conducted in six different construction sites in east Malaysia. Result showed that the significant correlation between workers perspective on safety management in construction site and accident that can cause more fatalities compared to other types of industries. The corresponding recommendations are ultimately put forward to prevent fatal accidents of construction activities. The patterns found in this paper can provide valuable direction for formulating accident prevention strategies. In future research, reporting of accident and near misses are important to be further explored.

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## **Evaluating Exploratory Factor Analysis of Psychosocial Study and Work Performance In Manufacturing Industry**

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The purpose of this study is to focus on the exploratory factors of psychosocial and work performance in the manufacturing industry in Malaysia. A cross-sectional study was conducted among 258 respondents from the manufacturing plant. The validity and reliability of a set questionnaire adapted and adopted from Copenhagen Psychosocial Questionnaire (COPSOQ III), NIOSH Generic Job Stress Questionnaire and Individual Work Performance Questionnaire (IWPQ 1.0) instruments were tested using Exploratory Factor Analysis (EFA) and reliability analysis. Forty-five items from psychosocial risk factors which are an interpersonal relationship at work, job demands, job control, career development, environment and equipment, job content and role in the organization and eighteen items from work performance which are task performance, contextual performance, and counterproductive work behavior, were designated for the initial instrument. The results showed that the originated 10 construct measure of psychosocial risk factors and work performance reduces into 8 construct measure understudy after conducting factor analysis by Principal Component Analysis as a dimensional reduction method. EFA statistical method enabled this study to increase the reliability of the scale by analyzing items in the instrument to be removed other than increase dimensional construct assessed the relationship between the factors in the study. This current study is essential to explore the presence of psychosocial risk factors that underly in the manufacturing industry which might affect the worker performance and well-being. Also, future research purposes this study can be utilized to develop a model of psychosocial risk factors and work performance in manufacturing using Structural Equation Modelling so the validated construct can be used and tested in the industry.

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# Investigation of Customer Purchase Intention towards Car Battery On-Site Delivery Services

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This study investigates the factors that influence customers' purchase intention among Bateriku.com customers. Through a self-administered questionnaire, data were collected from eighty-eight (88) customers who had experience using the service of on-site delivery of a car battery. This study is aimed to investigate perceptions of the customer on a new business model introduced by Bateriku.com for the purchase of the car battery and how this perception impacts upon the actual purchase that the customers make. This study will turn out to be a benchmark in comparing with the traditional purchase processes of the car battery and to understand the factors influencing the customers towards their purchase of the car battery using a new business process. Three (3) independent variables identified namely technology, service marketing, and people to investigate its impact on actual purchase by employing multiple regression analysis. The results of the study indicated that service marketing has a significant influence on customer purchase intention for the car battery on-site delivery. The results also showed the impact of technology in improving customer confidence towards the new business model. The recommendations are also provided to the Bateriku.com to exploit the advancement in technology to minimize further human interaction during the inquiry process to introduce process standardization for efficient operation. This study presents a foundational framework for future researchers to embark into new avenues in producing in-depth insights about new business models in acquiring car battery and related services.

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## An exploratory study on the readiness of Non-Muslim Rice manufacturer towards the implementation of Halal logistics

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The objective of this study is to unveil the issues encountered in Halal logistics implementation from the perspective of a Non-Muslim rice manufacturer. Since Halal is pertinent for the Muslim and also to the non-Muslim, it makes halal products were recognized and known globally especially for health, safety, and hygiene. With a view of that, this study is to determine the barriers facing by Non-Muslim Rice manufacturer in adopting Halal logistics and maintaining the integrity of Halal status throughout the supply chain process. This study is exploratory and data are collected through a series of in-depth interviews. Results obtained from this study

uncovered the various issues faced in the implementation of Halal logistics. Both barrier and influence factor uncovered in this study will be used as a reference for potential future research.

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## **Development of Robotic Rovers : A Review**

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The robotic rover is defined as a small vehicle that can move over rough ground and it is initially used by NASA for space exploration. However, this type of rover is expensive, using complicated and complex materials and softwares as well as large in size. Robotic rover fills the gap without endangering personnel involves in life-threatening condition or scenario that human sometimes needs to deal with. It can be considered to be deployed in assisting safety authorities to collect information and insights as well as work lift in search and rescue operations. In this paper, the progress that has been made towards the development of robotic rover which has been done in previous years are reviewed, including the design, functions, specifications, and applications, to meet requirements in performing a variety of tasks including hazardous identification, site surveillance and monitoring. Subsequent to this, a few analyses on the design and development of the proposed robotic rover are also discussed. The ultimate aim is to come out with such rover that is portable, small in size and low cost, together with user-friendly functions and specifications for future potential applications.

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## **Assessment of Volatile Organic Compounds (VOCs) in Multi-Storey Shopping Mall in Malacca, Malaysia**

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This study investigates the malls Indoor Air Quality (IAQ) to compare changes in levels of Volatile Organic Compounds (VOCs) concentration in the morning and evening. It also explores the sources of emission released that could be related to occupants health status (dizziness, headaches, flu, running nose, nose stuffy, nose irritation, eye irritation, watery eye and eye reddening). A questionnaire survey approach was used to collect quantitative data involving 32 workers from malls in Malacca, Malaysia. This study established models to measure changes in VOCs level in two different sessions for a given area. Also, predictors related to work context (human performance and condition) were found to be significantly related



to occupants symptoms. Two significant values identified the changes in VOCs concentration for morning and evening sessions in the lobby, bakery, eye ware shop, mobile centres and supermarket. No evidence supports the exposure towards the personal individual in the present findings. This study contributes to the literature on levels of VOCs in the shopping mall as well as the emission sources. It also suggests that more comprehensive monitoring can be achieved, particularly in the context of Malaysia.

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## **Comparison study of the spine kinematics by defining thoracic and lumbar spine as an individual and multi-segmental during a continuous motion sit-to-stand (STS) in healthy Asian adults.**

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**Keywords:** thoracic, lumbar, multi-segmental, passive, sit-to-stand, angular displacement

Dynamic change of spinal curvature during sit-to-stand (STS) manoeuvre is the frequently used motion but only few researchers have addressed the question of the spinal segmental contribution during sit-to-stand. The purpose of this study is to compare the kinematics of thoracic and lumbar spine using two approaches (1) as an individual and (2) multi-segmental during a continuous motion sit-to-stand (STS) in healthy Asian adults. Interclass correlation coefficient (ICC) showed excellent reliability with all ICC value were above 0.90 (0.950-0.984). Significant differences in the kinematics of thoracic and lumbar spine during STS were noticeable at all phases for thoracic and only at initial phase for lumbar curve. T6-8 segment displayed slightly higher flexion increment compared with the other segments while T4-6 segment displayed the lowest increment. All lumbar segments displayed approximately similar time response during the transition with middle segment showed the quickest transition while delayed behaviour occurred within the last segment. End lumbar segment showed delayed behaviours with change after 50% phase and in contrast, segment T4-6 showed highest contribution during STS. Present study found large variability in movement pattern of both thoracic and lumbar segments during STS. The findings may serve to highlight specific multi-segmental contribution instead of assuming thoracic and lumbar curve as single segment.

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# Investigating the spine kinematics of thoracic and lumbar spine assuming as (1) an individual and (2) multi-segmental during a continuous motion stand-to-flexion (STF) in healthy Asian adults.

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**Keywords:** thoracic, lumbar, multi-segmental, stand-to-flexion, angular displacement

The change of the back curvature during forward flexion require complex synergization between spines structure and still few researchers have addressed the question of the spinal segmental contribution during stand-to-flexion (STF). The purpose of this study is to compare the spine kinematics of thoracic and lumbar spine using two approaches (1)as an individual and (2)multi- segmental during a continuous motion STF in healthy Asian adults. Significant differences in the spinal kinematics during STF were noticeable at all phases between both approaches used. Significant difference of multi-segmental contribution were different for both regions (thoracic: 0%, lumbar: 100%). Results revealed high variance in thoracic segmental contribution at specific phases. Segments T1-4 and T6-8 showed approximately similar behaviours. High prevalence of delayed behaviour of thoracic segments in completing the task studied were found. Within lumbar region, lower segment displayed similar behaviour with the global lordosis curve during STF and recorded the highest mobility. Upper segment exhibits the least contribution and found to be inactive. The results may serve to increase our understanding of specific multi-segmental contribution during flexion which can be used for rehabilitation purposes and development of better spinal orthosis. This study provides further evidence of multi-segmental contribution compared rather than assuming spine as a single segment.

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# Fatigue Analysis of High Dump Truck Operators in Indonesias Coal Mining Industry: A Case Study

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**Keywords:** Coal mining, fatigue, Fatigue Likelihood Scoring (FLS), Fatigue Risk Management System (FRMS), high dump truck operator, Industrial Fatigue Research Committee (IFRC)

A coal mining industry typically applies a 24-hours working time, which enforces some workers to stay conscious during night shift, opposing human body's biological clock. This study aims to analyse the level of fatigue experienced by high dump truck operators (HD operators) in a coal mining site in East Kalimantan, Indonesia. This study utilizes primary data which obtained from distributing Industrial Fatigue Research Committee (IFRC) survey to all HD operators and secondary data (for Fatigue Likelihood Scoring - FLS) which consists of HD operators working schedule that currently applied in the company. Results obtained is analyzed using Fatigue Risk Management System (FRMS) framework which combines FLS classification and Dawson- McCullochs model of fatigue risk trajectory. This study reveals that based on IFRC survey, HD operators experienced low/mild fatigue due to insignificant influence of fatigue-related factors contained in the survey. However, consideration for improvement is in need since the result of fatigue for night shift operators is close to moderate level. In addition, based on FLS, the level of fatigue indicates that HD operators experienced excessive working hours, in which in FRMS graph classified as fatigue-related errors. Thus, this study proposes several strategies as the hazard control mechanism: (1) providing optimum resting time, (2) equipping operators with audio music that lead to positive energy and increasing work focus, and (3) adding afternoon shift to balance the working hours.

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## Eco-Process Innovation Performance: Production Waste Investigation through Discrete Event Simulation

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**Keywords:** Eco-process innovation; production waste; discrete event simulation, Arena software

Eco-process innovation has been recognised as an effective green strategy for altering manufacturing processes so as to improve a firms environmental performance. As many recent eco-innovation studies focusing on perceptual approach of investigating the performance indicators, new study opportunity knocked the door for new knowledge disclosure of operational approach, since it has been largely ignored. This paper aims to assess production waste improvement brought by eco-process

innovation implementation in a manufacturing facility. For this purpose, the discrete event simulation approach has been applied to model and simulate the waste rate of previous state and current state of an eco-innovated production line, using the real operational data. Comparison between both states of production system demonstrated a reduction of 0.080.02% in waste rate at visual mechanical inspection and final test inspection points consecutively, hence confirmed that eco-process innovation practice enabled the improvement of the environmental performance of manufacturing firm. The study is a small part of a larger research work of which the authors are developing indicators for measuring eco-process innovation performance at the firm level.

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## **Effect of Processing Parameters and Material Mixture Fraction on Tensile Strength for Plastic Waste-Sawdust Composites**

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**Keywords:** Plastic Waste Composites (PWC), Mechanical properties, Mechanical testing, Compression moulding

Human dependence on the millennium era on plastic is very high, this is evidenced by the many uses of plastic waste around us, the presence of plastic will affect the environment because the chemical properties of hard-to-decompose plastics make waste start reacting to other elements, this research is made using plastic waste and sawdust to make new materials with different mix specifications, the results obtained showed the tensile strength of a mixture of HDPE specimens of 11.5 grams, 5 grams of PET and 1.5 grams of sawdust at a pressure of 5000 grams and the temperature of 120 C had the highest value is 195.1 N / mm and the lowest is 83.7 N / mm in the mixture. The same pressure is the difference at the lowest temperature of 100 C, this proves that temperature has a large influence on the strength of the material used while DOE optimization is obtained at 118 °C up to 120 °C with an optimum value of 257.141 °C.

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## Investigation on Young Adult Hand Grip Strength

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**Keywords:** Hand grip, hand muscle, young adults

The purpose of this paper is to investigate the strength of the hand grip among the young adults in Malaysia. Also, to examine the correlation between anthropometry factors such as hand length (HL), hand breadth (HB), wrist circumference (WC) and body mass index (BMI) with average full hand grip strength of young adults. 40 Malaysian young adults with equal females and males and the range age of 23 to 28 years old voluntarily participated in this study. Three experiments were conducted in sitting position according to American Standard Hand Therapist (ASHT) with 45°, 90° and 135° of hand flexion using dynamometer. The results show the significant different full hand grip strength between Malaysian young adult females and females, the difference full hand grip strength for different hand flexion angles in sitting position and difference correlations between anthropometry factors and full hand grip strength for both young adult males and females.

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## MyMUET: A design of a mobile based crowdsourced assessment for Malaysia University English Test with non synchronous participant interaction

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**Keywords:** muet application, mobile education, crowdsourcing service

Malaysian University English Test is a compulsory exam for local Malaysian students and a prerequisite for graduation. In 2017, more than five hundred thousand local students were enrolled in Malaysian public universities and therefore will need to sit for this examination. This enrolment number is increasing every year. However, there number of competent TESL graduates or English teachers available

to cater this volume of students yearly is unknown. Many of these students are not from English speaking background and there are limited resources and assistant available for tutors who need to cater the demand of these students. Even though there are many resources online, the resources for speaking module mainly consists of tips to score and question examples . Students are unable to get feedback of their speaking module even if they practiced the mock exam questions. Moreover, the MUET speaking exam consists of group speaking tasks which the student or user may not be able to fulfil the quorum for practice. This paper shall propose MyMUET, a design of a one stop mobile based crowdsourcing tutor service for MUET to enable students to be able to obtain real time feedback of their speaking exam with interaction with non real time participants with recommended tutors. Other MUET modules such as writing, reading and listening is also available to be used. MyMUET is developed based on Android studio and enables tutors to list their services and students to select the respective tutors. This method saves time for tutors to develop their own exam questions, enable them to focus on evaluation. This shall also be able to standardize the MUET examination to students receive high quality mock exam questions. MyMUET is then evaluated to ensure its relevance based on subject matter expert feedback. The evaluated system shows that students and academic expert find the application helpful to improve students learning experience.

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## **The Analysis of Influential Factors of Halal Supply Chain Management Implementation Based on Food Services in Banda Aceh Hotels**

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**Keywords:** Halal, Food Service, Halal Supply Chain Management, Multiple Linear Regression.

Aceh is a Province in Indonesia that implements Islamic law in its territory and is regulated by Qanun decree. Aceh Qanun No. 8/2016 confirms the determination of the halal product guarantee system. However, the Qanun is lack on presenting, regulating and providing information about Halal Supply Chain Management (HSCM). HSCM is a management in which the entire process must be halal, from suppliers to products purchased by consumers. This research was conducted on food services in hotels that have halal certification in Banda Aceh and surrounding areas which aim to see the implementation of HSCM based on food services by looking at the relationship of the most influential factors using multiple linear regression. There are seven relationships between variables that form hypotheses, namely halal management, quality of halal food hygiene, halal warehousing, halal transportation, halal raw materials, halal production facilities and halal outsourcing and suppliers.

Anova testing (F-test) shows that all factors influence on HSCM. However, Partial testing (T-test) shows that the most influence factors on HSCM given by halal management and warehousing management.

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## **Key Performance Indicator of Sustainability in the Malaysian Food Supply Chain**

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**Keywords:** Food Supply Chain, Key Performance Indicator, Sustainability, Malaysia

The food supply chain in Malaysia plays an important role in the economy. Since the industry is dominated by small and medium-sized enterprises, the local food supply chain must satisfy consumer demand. In order to help Malaysia to become more self-sufficient, improvements in the supply chain in terms of key performance indicators (KPIs) are important. However, it is common that strategic and operational KPIs are different and a disparity often exists between them. To be more successful for measuring the entire supply chain, the linkage of strategic objectives to operational objectives must be aligned to ensure the appropriate KPIs measure a proper connection between what they do and what the business achieves. The aim of this paper is to propose a preliminary key indicator to measure sustainable performance in the Malaysian food supply chain. Key indicators were summarized in previous research on the food supply chain between 2007 and 2018. A total of nine perspectives on sustainable performance measures in the food supply chain involved employee, supplier, health and safety, community, customer, cost effectiveness, quality, compliance and efficiency. These perspectives can be classified into three hierarchies; namely, strategic, tactical and operational. This paper proposes integration of key indicators as a starting point to measure the generic performance of the Malaysian food supply chain.

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# **The Influence of Children Playroom Interior Aspect to Parents Safety Perception, Case Study: Children Playroom at 23 Paskal Bandung, Indonesia**

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**Keywords:** children playroom, interior, safety perception

Children playroom in public spaces needs to consider the safety of its interior elements. Previous studies also discussed about things that need to be taken into account to assure the children safety while playing. However, some parents join their children playing in public spaces due to the cautiousness of playground safety level. This study was conducted to understand how far the interior aspects of children playground can affect parents safety perception to let their children play by themselves in public spaces, for example the children playroom in 23 Paskal Bandung, West Java, Indonesia. The result shows that sufficient light, interior finishes, and noise or sound intensity in children playground 23 Paskal Bandung, Indonesia, can make parents feel safe to let their children spending time there.

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## **Analysis Of Port Fare Increases On Container Yard Services Using Logistic Regression Model**

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**Keywords:** Port, Container, Container Yard, Logistic Regression Model, Loss Cost, Port Fare

The port company used in this research is the only port where container ship contained in Aceh and has been operating for more than 1 year. The problem with this was the large buildup of containers with long periods of time in the cultivation field that would cause losses. Losses due to the duration of the buildup are influenced by several factors, such as the yard of ratio and the length of time the container is reviewed based on the large number of containers in the container yard. For payment of the first five days of service, the container accumulation fare shall be borne by container owner company as stakeholder of port company. After more than five days, the customer will be charged the container accumulation rate calculated per box without any time consideration. This causes the customers dont take the goods immediately, therefore it was necessary to do research on the analysis of port fare increase in port company in Aceh using logistic regression model as the basic of decision making. Based on the prediction of logistic regression model using software R3.4.3, there was a loss cost in the container yard, therefore it was necessary to take decision of the application of the port fare increase on container yard service. Based



on the results of these predictions, the resulting model was a good model with an accuracy of 74.8%. The factor that affect of the loss cost was the length of time the container in the container yard period II and III.

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## **The Measurement of Nurses' Mental Workload Using NASA-TLX (A Case Study)**

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**Keywords:** Mental Workload, NASA-TLX, Nurse, Healthcare

Nurse is a profession that has a quite high workload. It can be seen from how often they should encounter situations which compel them to undergo precisely right decision in saving patients lives. Various environmental conditions increase the frustration rate of the nurses, such as noise of the crowds and medical equipment, as well as smell of medicines and wounds at once. Moreover, demands from the patients family make it even tougher for them. Therefore, this study aims to measure the mental workload of the nurses at Intensive Care Unit (ICU) and emergency unit (IGD) in the Hospital ZA based on their years of service. The study was conducted using the method of NASA-TLX (National Aeronautics and Space Administration Task Load Index). It measured the workload in six dimensions: Mental Demand (MD), Physical Demand (PD), Temporal Demand (TD), Own Performance (P), Effort (EF), and Frustration Rate (FR). The results of the study show that the average value of the nurses workload at ICU and IGD is in the category very high (respectively 80 and 83) for the nurses with 0-3 years of service, and the most contributing factor for both the primary groups is the effort (EF).

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## **Instrumental Music vs. Quran Recitation: Which has the Most Influence on the Accuracy and Speed of Work**

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**Keywords:** Quran recitation, instrumental music, accuracy, speed, Stroop task.

Many studies have proved that instrumental music as well as Qur'an recitation affects human factors such as mood, performance, and intelligence. However, to the best of our knowledge, there is no research on the influence of instrumental music and Quran recitation on work productivity. This study examined the impact of instrumental music and Quran recitation on work productivity, especially

on the accuracy and the speed of work. The study involved 20 people of productive age (15-64 years) as respondents. The true experimental one group pre-test and post-test design were used in analyzing the data. The data collected are the speed and the number of errors when conducting the Stroop task. The study found that instrumental music, as well as the Quran recitation, has a significant contribution to the increase of the accuracy and the speed of work ( $p=0.000$ ). The study also proved that Quran recitation has a significantly higher effect on work speed and accuracy compared to instrumental music treatment ( $p=0.000$ ). The average speed of conducting the Stroop task with the Qur'an recitation treatment is 7.67% higher than with the instrumental music. Furthermore, the average number of errors with Quran recitation treatment is significantly lower ( $e=2.933$ ) than with the instrumental music treatment ( $e=4.683$ ).

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## Redesign of Breastfeeding Chair for Nursery Room

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**Keywords:** Breastfeeding Chair, Anthropometry, Nursery Room, Quality Function Deployment (QFD)

Breastfeeding chair is one of the essential facilities in airport. This study designs the breastfeeding chair for nursery room in Minangkabau International Airport. Quality Function Deployment (QFD) was used to investigate the customer requirements by distributing questionnaires to 100 mothers in Padang West Sumatra. Anthropometry data was also measured form those respondents. The study resulted in a design of ergonomic breastfeeding chair which was used features obtained from the voice of the customers. The design has considered the condition of the mother giving birth by normal as well as cesarean. The design has an adjustable back seat with an angle of  $95^\circ$ ,  $105^\circ$ , and  $110^\circ$ ; an adjustable footrest with  $120^\circ$ ,  $140^\circ$ , and  $180^\circ$  angles. The chair has a headrest, baby support pad, a portable baby cushion, an adjustable baby bearings. The chair has also equipped with an assemble torn neck, a small drawer on the side of the chair, and a palm rest that can be used or not by adjusting the height.

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# Enhancement Tourist Satisfaction Through Determination of Ideal Public Facilities Capacity using Queueing Theory

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**Keywords:** Queueing Theory, Waiting time, Capacity, Utilization.

Nowadays, toilet is no longer apparent as merely insignificant component for the public facilities especially related to the tourism area. The facilities in the toilet contributes and serves more than the initial purposes intended. However, public toilet in Malaysia are often seen as poorly designed and maintain by the operator of the toilet. One prime solution for improving public toilet is managing the whole system in a completely new manner which should based on the user requirement and needs. Government initiative under Public Service Delivery Transformation emphasize on improvement of service delivery to the people and one of initiative is to improve the public toilet especially for tourism spot. This reseach studied the capacity of public toilet for facility improvement using Queueing Theory to cater the congestion and long waiting time for getting the servic . The performance measure of this adopted queue model was carried out to determine the number of users waiting time in the queue and system, as well as the utilization rate for the servers. Based on the current users characteristics and system, the suitable queueing model is M/M/C with multiple, C servers. The objective of this project is to analyse the capability of current public toilet in producing service that improve users satisfaction. Data collection for almost three month conducted with purpose to determine peak time on toilet usage. Two week data collection sessions were conducted to identify significant variants of data set. Next, data for duration of users usage, number of users queue outside the cubicle toilet and cubicle bathroom are collected. Based on server utilization rate, the cubicle toilet and female bathroom is insufficient to provide service to the users since the server utilization is greater than 1. Queueing theory again is used to identify the ideal number of toilet cubicles and the bathroom cubicle. Toilets have been renovatted to accommodate the necessary cubicle toilet and bathroom. After the improvement, the waiting time has been reduced 50%.

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# The Effect Of Employability On Inter-Organizational Mobility By Women Technologist: Mediation By Psychological Well-Being.

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**Keywords:** employability, psychological well-being, interorganizational mobility, engineering technology.

Today's phenomenon shown that female graduates began to dominate the technical division in local industries in the country. However, inter-organizational mobility often occurs among the technical women that lead to the loss of valuable human resources to the organization and thereby create a product safety confidentiality issue. In this regard, this study was conducted to identify factors affecting the mobility of industry among graduates of female engineering technology. Based on the previous study, the proportion of female graduates aged 23 to 30 who made inter-organizational mobility was higher than men. Therefore, based on the boundaryless career theory, this study was conducted to examine the relationship between employability, psychological well-being and inter-organizational mobility among 114 women's engineering technology graduates who are working in industry in Malaysia. A model has been developed and tested using SEM techniques using SmartPLS software. The findings show that there is a negative relationship between employability and inter-organizational mobility, as well as psychological well-being toward inter-organizational mobility. Employer and higher learning institutions should cooperate each other in term of policies and regulations development as well as engineering technology curriculum. Besides that, employers should provide adequate training to women's engineering technology graduates who are new to their workplace so that they can increased employability skill in their new workplace.

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## Research in Halal Certification: A Literature Review

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**Keywords:** Halal certification, halal industry, islamic marketing

This article will discuss about the perception towards halal certification, its correlation with halal certification and marketing, performance, human capital, service quality in its certification process, the comparison among certification providers as well the issues and challenges in the research of halal certification. This article is objected to provide understanding on previous researches about halal certification and to propose potential future research. The method applied is Systematic Literature

Review. Based on the discussion, it can be resolved that this certification research only considers on Halal Food Category, Halal Cosmetics and Islamic Finance. Other fields that can be explored further are Halal travel, Halal Pharmaceuticals, Halal Fashion, Halal Media and Recreation. Most of the researches were conducted in Malaysia. Hence, other researches performed in different countries should be carried out to generalize the results of researches.

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## **Research in Shariah Hotel: Issues and Challenges**

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Indonesia

**Keywords:** Halal hotel, halal industry, halal certification, shariah hotel

This article discusses about the researches conducted on halal hotel or shariah compliant hotel. Shariah-Compliant Hotel (SCH) is defined as a hotel that provides services based on syariah principles. This article is designated to provide understanding on earlier researches about shariah hotel that were performed by previous researchers as well as future potential researches. Systematic literature review is employed as the method in this article. The review will involve 31 papers that contain the words of halal/Islamic hotel, shariah hotel and Islamic hospitality on their title. From the discussion, it can be concluded that based on its objective, the research on this shariah hotel could be classified into seven discussions, which cover the attributes, practices, marketing, shariah-compliant and Islamic tourism, performance, halal awareness, halal obedience, opportunities and challenge on shariah hotel. Future research will be directed to discuss about the attributes on shariah hotel, practices of shariah-compliant hotel and customers consideration, but not limited to deliberate other related topics.

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## **Analysis of Product Quality Control Using Six Sigma Method**

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**Keywords:** Quality, Six Sigma, DMAIC, Fishbone

Quality control is the activity of management to measure the quality characteristics of the product, compare it with specifications or requirements, and take appropriate action if there is a difference between the actual appearance of the standard. Every company needs an operational system that can indicate and overcome defective or damaged products, the company must control quality in each of its production processes. This study aims to determine the quality control of production

and actions that should be done by the company to reduce product failure. The research subject used is a case study at the company, this manufacturing company produces bottled water products. The data used in the study include primary and secondary data, and data collection methods used are interviews, observation and documentation. Analysis of the data used in this study is the Six Sigma method which includes five stages of DMAIC analysis namely define, measure, analyze, improve and control. This study revealed that there are five types of defects namely lid defects, cup defects, sliding machine, volume defects, and dirty water. Based on the calculation of sigma value, the average sigma value of company is 4.39 with 2,047.96 Defect per Million Opportunities (DPMO). Fishbone diagrams are carried out to analyze the causal factors of defective products, namely machinery, humans, methods, and materials.

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## **Management Analysis on Occupational Health and Safety in the Boiler House by Using Method of Hazard Identification, Risk Assessment and Determining Control (HIRA DC)**

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**Keywords:** determining control, hazard identification, risk assessment.

PT XYZ is a company in the field of agrobusiness that produces Crude Palm Oil (CPO). The problem has occurred due to out-of-dated safety book. A research is required to overcome the problem by updating the safety book that designated specifically for boiler house. The determination of new safety book could be initiated by observing the boiler house. Later, the risk assessments will be conducted to determine the mitigation on new risks. In implementing those steps, the method of Hazard Identification, Risk Assessment and Determining Control (HIRA DC) is involved. HIRA DC method is used to perform assessment on existing problems. The results indicated the highest risk assessment was on physiological hazards with score of 15, heat hazard with 12, falling and slipping hazards scored with 4, and the lowest is chemical substances exposure hazard with score of 3.

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# The Reduction of Waste on Pile Production Process Using Value Stream Analysis Tool (VALSAT) Method

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**Keywords:** cycle time, pile production, Value Stream Analysis Tool (VALSAT), waste

This paper discusses about the reduction of waste on the pile production process in PT. XYZ, a company that run its business in the field of engineering, production installation (EPI) of a concrete industry. The methods of data collection are observation and interview. The analysis that will be employed is Value Stream Analysis Tool (VALSAT). Based on the value stream mapping, it is identified that the cycle time data for products manufacturing is 5.847 seconds with lead time of 1.380 seconds. Based on the result of observation and interview, it is identified that the biggest waste is resulted from the waste of excessive transportation. The movement process is executed on the same workstation and among workstations. While, the result of process activity mapping indicates that 27,6% of all activities are included in transportation activities. By conducting the mapping using fishbone diagram, later could be identified the factors that influence waste, in which, from human resource perspectives, it is caused by the less-evenly workers distribution at line 2 on pile production, unbalance production process that causes idle time or idled operators, the lack of understanding and workers skill on machine utilization as well in handling the problems. In the perspective of method, the issue lies on layout factors and 5S system that runs inappropriately at line two. In terms of machine, it is stressed on the lack of numbers of tools or machines as well as the less upgraded machines. From the perspective of environment, rain definitely could affect the condensation maintaining process and evaporation.

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## Supplier Selection and Determination of Quantity of Raw Material Orders Using Analytical Hierarchy Process (AHP) and Linear Programming: A Preliminary Study

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**Keywords:** Supplier Selection, AHP, Linear Programming

This article discusses the preliminary study about the selection and determination of order quantities of raw materials using the Analytical Hierarchy Process (AHP) and Linear Programming methods. AHP is used to carry out the weighting

of each criterion and sub-criteria so that suppliers are found to be in accordance with the company, while linear programming is used to determine optimal raw material orders from each supplier that has been sorted. The purpose of writing this article is to provide a basis for the research that will be conducted. The method used in writing this article is a review literature. Based on inductive studies it can be concluded that the research that will be conducted has a difference with previous similar studies, namely the method used and the criteria set.

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## Association between Schoolbag Weight and Back Pain among Primary Schoolchildren in Kajang, Selangor The Effectiveness of Fire and Burns at Home Education Among Primary School Children in Hulu Langat, Selangor

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**Keywords:** Primary schoolchildren, schoolbag weight, back pain, Kajang

**Introduction:** These days, there is a growing concern that schoolchildren are carrying too heavy school back on their backs. The use of a back pack is the most important factor causing low back pain among students. Thus, a cross sectional study was conducted on 81 schoolchildren from two different types of primary school in Kajang, Selangor. **Objective:** To determine the association between schoolbag weight and back pain among primary schoolchildren in Kajang, Selangor. **Method:** Respondents body weight and their schoolbag weight were measured using the electronic body composition OMRON and KERN weighing scale respectively, while the height was measured using Body Meter Seca 208cm. Back pain in the past one week was assessed using a questionnaire, adapted from previous studies. **Result:** This was a cross sectional study involving 81 primary schoolchildren from two types of school which were government and private school. 74.1% of schoolchildren had the schoolbag weight more than 10% of their body weight. 32.1% of schoolchildren reported having back pain and 21.0% of them were female respondents. Back pain were detected in 24.7% government schoolchildren and 7.4% private schoolchildren. There was significant association between back pain and; relative weight ( $\chi^2=9.720, p=0.002$ ) and types of school ( $\chi^2=4.949, p=0.026$ ). **Conclusion:** Schoolchildren that carry schoolbag heavier than that generally recommended which is not more than 10% of body weight will experienced the back pain.

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# The Effectiveness of Fire and Burns at Home Education Among Primary School Children in Hulu Langat, Selangor

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**Keywords:** Fire and burn, Home injuries, Intervention learning model, School children

**Introduction: Objective:** To study the effectiveness of fire and burns at home education among primary school children in Hulu Langat, Selangor. **Method:** This study uses pre-test and post-test Quasi Experimental design to evaluate the effectiveness of fire and burns at home education among primary school children in Hulu Langat, Selangor. The total number of 152 (76 x 2) students involved in this study from two primary schools. Students were divided into control and experimental groups. Experimental group was introduced with intervention learning model. Both groups were distributed with self-administered, validated and pre-tested questionnaires regarding their knowledge on fire and burns at home. Descriptive analysis was used for social-demographic distribution. As the data were normally distributed, Independent T-test was performed to compare between two unpaired groups while Paired T-test was used to compare the knowledge score before- after the introduction of learning model. Data was analyzed using SPSS version 21. **Result:** There was a significant improvement in the knowledge level among the experimental group after they participated in the educational session ( $p < 0.001$ ). The background knowledge level between control and experimental groups were not significantly different ( $p = 0.97$ ). However, a higher knowledge level was significantly seen in a sub-group of urban school compared to rural school ( $p < 0.001$ ). **Conclusion:** Home related injuries involving fire and burn are indeed a growing public health problem. Thus, educational and intervention program are necessary to improve the knowledge level of the children. This improvement is expected to encourage the children to mold behavior from young ages so that safety and preventive methods become a practice.

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## Ergonomic Design of The Cutting Machine for Chopping *Cyperaceae* Plant

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**Keywords:** *Cyperaceae*, Musculoskeletal Disorders, Participatory Ergonomic, *Fimbristylis Globulosa*

The manual cutting is still applied in the Small and Medium Industries (SMI) especially in cutting the *Cyperaceae* plant. One of the varieties is *Fimbristylis Globulosa* (*Mendong*). This plant is used as a raw material to manufacture the handicraft. The process is commenced with chopping the plant by using a manual tool. However, the existing tool still causes some complains where 90% of users experienced discomfort and unsafe in the use. The tool is also not effective and efficient for cutting. Thus, it is significant to improve the better cutting tools. This objective of this study is to design the innovative and ergonomic cutting tools for satisfying user requirements. The survey was done to identify some discomfort. The participatory ergonomic method is applied to determine the specification of design on basis anthropometry data of users. Non-parametric statistical analysis is conducted to test the hypothesis. The results of this study show that the developed design is a valid to reduce the risk of work-related musculoskeletal disorders and more comfort and safer at 5% of the significant levels where the proposed design specification used electric motor system and pneumatic system.

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## Study Of Cybersickness On Non-Immersive Virtual Reality Using Smartphone

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**Keywords:** cybersickness; non-immersive VE; electromyography; eyestrain; muscle contraction

Cybersickness is one of the psycho-physiological responses affecting human performances when it is interacted with Virtual Environment. Virtual Environment (VE) is an advanced technology model generated by computer which users may feel presence like in the real environment. The exposure to VE repetitively causes sickness, especially the eyestrain when the eyes make an accommodation and focus on the virtual object. This symptom can be identified on the eyes movement and the eyes muscle contraction. Thus, this is significant to evaluate the contraction of eyes muscle. The objective of this study is to analyze the eyestrain in the use of smartphone for playing the war game. Empirical study was conducted to gather

the relevance data. Ten subjects were participated in this study which they were familiar with the game. Electromyography (EMG) was used to record the signal of muscle contraction on lateral eyes muscle. Statistical analysis was conducted to test the hypothesis. The result of this study showed that there was a significant difference in visual acuity between normal brightness and 0% brightness and 100% brightness of smartphone while sitting in operating. There was also significant difference in visual acuity between the normal brightness 0%, 50%, and 100% of brightness depending on the position. As for the higher contraction on lateral rectus muscle of the eyes occurred in position than sitting position at any level of brightness.

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## **Ergonomics Study of Stretcher for Rescuer to Lift Drown Body**

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**Keywords:** Rescuer, stretcher, drown body, task performance, safety, time consume

Drowning is one of 10 leading causes of death in every region of the world especially in the picnic and recreation. Statistics from Fire and Rescue Department showed an average of 700 people drown each year in this country. There were also cases where casualty to rescuers during the Save and Rescue Operation (SAR). As the incidents increased, the task of rescuers and equipment used should be reviewed. **Issue** How to ease rescuer task and safely lift underwater drown body. **Problem Statement** Difficulties arise during lifting drown body from underwater to the surface due to certain circumstances. This involved safety to rescuers, process of rescuing and time consuming of the operation. **Objective** The objective of this study is to determine the efficient ways of lifting drown body based on rescuers preferences. From the results, new stretcher design parameters will be established. **Method** Thirty rescuers from two Water Rescue Teams namely PPDA Putrajaya and PPDA Shah Alam Branches participated in this study. They are 24 male and 6 female aged between 23 to 51 years with mean of age at 29.5 year and experienced in SAR. **Instrument** Questionnaires were used to identify factors contributed to success or failure of any SAR operation. Likert scale questions were used to measure their preferences. Data then processed using statistical software (SPSS). **Results** Findings shows that all respondents agreed that lifting method is the most significant factor affecting their task performance, safety and time consumes. Meanwhile 83.3% of them strongly agreed and 16.7% agreed the usage of proposed floatable stretcher to lift drown body in their future SAR.

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## Accessing driving posture among elderly taxi drivers in Malaysian using RULA and QEC approach

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**Keywords:** RULA, QEC, elderly, taxi driver, awkward posture, ergonomics

The an elderly community may continue to serve their services to others jobs after retirement and looking light works accordance to their ability to support family economic financial and to sustainable life in the challenging world. The alternative professions could involve these communities are being a taxi driver. Hence, the characteristic of elderly taxi driver it so crucial to understanding, it may causes of the ageing process make elderly people more vulnerable to injury. Due to that, sitting which is the work posture of a driver should be properly done to avoid injuries among elderly taxi drivers. Seated posture as potentially unhealthy and considered as one of the major contributing factors for several musculoskeletal disorders (MSDs) such as pain in the lower back part and shoulder. Due to increased exposures to seated posture in the car, the proper sitting adjustment has become an important issue that demands adequate ergonomic interventions. A cross-sectional study was conducted with elderly taxi drivers using a self-administered questionnaire. It included questions on social-demographic data, Rapid Upper Limb Assessment (RULA) and Quick Exposure Check (QEC). Purposive method sampling used base on inclusive criteria; age 60 years old and above, self-driving taxi more than 1 year, no disabilities and registered with Ministry of Transport (MOT). Total of 443 respondents participated in the study. SPSS software version 20.0 to analyze data and RULA and QEC form was used. More than half elderly taxi driver used budget car (57.6%) type of taxi and most of elderly taxi drivers smoking (66.0%). More than half respondents (70.0%) having feeling back pain past 12 months and 75.4% feeling back pain last seven days. 94.8% elderly taxi drivers complain feeling low back pain. QEC showed higher score - neck (20.8%) and back body part (6.5%) and others factors at high score - driving (86.4%) and vibration (45.6%). RULA analysis body score at value score 7 (23.5%)- required change immediately and value score 5/6 (61.9%) - required investigation and change soon. Inappropriate seating posture among elderly taxi drivers may cause discomfort and developing MSDs. The implication low awareness on ergonomics education could reflect quality lifestyle and health among elderly taxi drivers in Malaysia.

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# Non-Intrusive, Visual-less Wearable Haptic Stimuli Navigational Assistance for Elderly with Dementia

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**Keywords:** elderly with dementia, spatial disorientation, navigational assistance, haptic stimuli, wearable device

Age is typically affiliated with the decline of cognitive function and the probability to be diagnosed with neurodegenerative disease, namely dementia. Of all dementia-related deficits, the paper highlights on the decline of wayfinding ability, since it is interrelated with mobility, autonomy, caregiving burden and eventually institutionalization. The sense of directions in elderly is also effected by the sensory changes, while the most obvious sensory declines are both vision and hearing. Hence navigation systems that support mainly on visual and auditory may not be the best option for them. A concept of wearable navigational assistance that is non-intrusive and uses haptic stimuli instead of visual and/or audio signals is presented in this paper. A Usability Test (UT) was performed towards the elderly with dementia at a selected nursing home to investigate how they perceive haptic-feedback as a modality of navigation. The assessments involved three phases: (1) orientation or training, (2) navigation test and (3) further navigation test. Results indicate the potential efficacy of haptic modality as a navigation signal. Improvement on subjects navigational performance was shown especially during the further navigation test, signifying the familiarization of the intervention. Employing the haptic modality could be a beneficial substitute for navigational purpose when vision and audio are less appropriate. Nevertheless, as much as the encouraging outcomes from the results and analysis of the assessments are valuable, the constructive reviews attained are indeed important for the future development of the device system.

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## The Development of SORREL Systematic Roselle Harvesting System for Efficient Transfer Process

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**Keywords:** Roselle, harvesting system, transfer process, deseeding.

Roselle (*Hibiscus sabdariffa* L.) belongs to the family of Malvaceae or Hibiscus the Malaysian national flower. In Malaysia, this plant is first introduced in the state of Terengganu as one of the alternatives to replace tobacco plants in sandy soils. Studies conducted on Roselle plantation in Malaysia identified too many repetitive steps in harvesting and deseeding process, as well as separating different grades of Roselle flowers and its logistics. The paper focuses on the improvement of harvesting and deseeding Roselle flowers, aiming to hybridize both processes into one effective process. The reason of developing such combination is to prevent frequent transferring of Roselle flowers to avoid damages, at the same time increasing the quality of harvest. This study also considers embedding few appropriate but simple technologies for systematic harvesting, making sure the Roselle flowers collected are in top quality and in best hygiene by user-friendly, ergonomic and safe to use processes.

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## The Development of Sustainable Product Design Method for Sustainable and Successful New Products

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**Keywords:** Emotional responses, perceived product quality, sustainable product design, and successful product.

Currently, most of the product designers have insufficient source in integrating the potential meanings when they are developing a new product. Also, it has become extremely challenging in verifying the variables of a product that could lead towards sustainable and successful products in the market. The development of a new product is not only to cater to the users' satisfactions, but additionally, it should attract more users. In this paper, the Sustainable Product Design Method (SPDM) is introduced as a process to identify and verify the variables of the users' emotional responses and perceived product quality, and element of sustainability in the early stage of the design process. The SPDM is a design guideline attempt to

establish the sustainable product requirements (SPR) towards the sustainable and successful products. To prove the practicability of this method, one of the successful products was chosen as a case study. It has been found that the method built is valuable in facilitating the product designers in the early stage of product design and development process. The validation signified from this process is not only contributed towards product sustainability but also increase on its success in the market.

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## **The Development of Sustainable Product Design Method for Sustainable and Successful New Products**

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**Keywords:** Flexible Packaging Industry, Pick-and-Place System, Embedded System, Design of Machine Electronics.

Flexible packaging manufacturing is one of the most essential industry of the world nowadays. This research aims to develop an economical pick-and-place sorting system for bag- making machines in the packaging industry. It provides a standard universal setup that is feasible to adapt with any type of bag-making machine as a pick-and-place attachment. This automated system can be installed at pickup location of the bag-making machine for the operation of pick-and-place of packaging bags, which is able to distribute packaging bags into the accepted bags platform without the supervision of a physical operator. This pick-and-place sorting system is able differentiate between two colored bags while accepting the correct dimension of it to place it at a location of accepted bag else at a location of rejected bag. The proposed machine system is able to sort-out three different dimensions of test samples by accepting bags with a fiducial mark and correct dimension only, while rejecting the bags without fiducial mark and of incorrect dimensions. A standalone mechanical structure based on stepper motors, electronics design and embedded control system was developed that includes an IR-proximity sensor, as a fiducial mark/colour detector and a loadcell based dimension analyzer, to differentiate between different dimensions of the test samples.

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# Physical Ergonomic Application Preferences in The Design Development Process Among Malaysian Designers

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**Keywords:** Physical ergonomic, design process, ergo-aesthetic.

The industrial designer plays a vital role within the consumerism cycle by making a new technology or an item pleasurable to be owned. The pleasure of owning an item lies inside the aesthetic and ergonomic principle where user preferences placed as a priority. The purpose of this study is to see the current practices among Malaysian who specialise in design field implementing one of the ergonomic sub-criteria, which is physical ergonomic. Using a non-probability purposive sampling survey, a set of data from 603 respondents has been obtained throughout 32 institutions that practice design-related activities. A general overview of Malaysian designers preference on physical ergonomic during design development process has been organised accordingly towards physical, ergonomic sub-domain. The main finding of this research is the priority separation level inside the physical ergonomic element, which will help designers determine the most important criteria during designing. This will tremendously help to increase the efficiency of the designer performing the design development process. This tabulation on designers preference also will help in the development of a new design framework consisting of the enhanced aspect of the physical, ergonomic domain. Furthermore, it will help the university in Malaysia to seek the loophole in their curriculum structure to further enhance the design field student quality, respectively.

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## Technology Content Assessment in Small Medium Enterprise (SME) of Wood Furniture in Yogyakarta, Indonesia

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**Keywords:** technology-based development, technology component, technology content assessment, small medium enterprise, wood furniture.

The concept of technology-based development plays an important role to analyse the level of technology in an organization. This research aims to measures the level of



technology at 6 small medium enterprises (SME) in Yogyakarta who producing wood furniture such as a set of table and chair employing technology content assessment comprises technoware, humanware, infoware, and orgaware (THIO). THIO can be used as a benchmark to determine an improvement strategy for an organization. The technometric model is to calculate TCC (Total Contribution Coefficient) classified into 6 categories from very low until highly sophisticated. It indicates the gap of technology content between input and output. The data is obtained by spreading a questionnaire to the owner of every SME consisting of THIO component. According to TCC results, all SMEs have a value between 0.3 to 0.4 (low contribution). The 4 components of technology are under normal classification (0.5) but above the low classification. Each SME generates the same humanware value, which is 0.33. One SME who achieved the highest TCC value can be the benchmark in order to increase each component of technology as well as reaching a better TCC of 0.5 (normal).

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## **Performance of Fiberglass Mat and Woven for Prosthetic Leg Socket Application**

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**Keywords:** technology-based development, technology component, technology content assessment, small medium enterprise, wood furniture.

The concept of technology-based development plays an important role to analyse the level of technology in an organization. This research aims to measures the level of technology at 6 small medium enterprises (SME) in Yogyakarta who producing wood furniture such as a set of table and chair employing technology content assessment comprises technoware, humanware, infoware, and orgaware (THIO). THIO can be used as a benchmark to determine an improvement strategy for an organization. The technometric model is to calculate TCC (Total Contribution Coefficient) classified into 6 categories from very low until highly sophisticated. It indicates the gap of technology content between input and output. The data is obtained by spreading a questionnaire to the owner of every SME consisting of THIO component. According to TCC results, all SMEs have a value between 0.3 to 0.4 (low contribution). The 4 components of technology are under normal classification (0.5) but above the low classification. Each SME generates the same humanware value, which is 0.33. One SME who achieved the highest TCC value can be the benchmark in order to increase each component of technology as well as reaching a better TCC of 0.5 (normal).

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# Designing Disaster Recovery Plan of Data System for University

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**Keywords:** Disaster, Disaster Recovery Plan, University.

According to the QS World University Rankings, Andalas University is a 3-star university and is in ranked 12th of the best universities in Indonesia based on the Indonesian Ministry of Research and Higher Education criteria. The university is located in three different areas which are Padang, Payakumbuh, and Dhamasraya. Currently, the university's Information and Communication Technology Development Unit which is responsible in managing the information and communication technology has no formal documentation of response procedures in an event of an emergency. Being used by some 26,702 students and staffs, the system is potentially corrupted by a few possible disasters like viruses, hackers, and server downs. Therefore it is crucial for the organization to plan a documented security action to protect essential archives and application software in anticipating the catastrophes. This study developed a Disaster Recovery Plan (DRP), as a document to act on accidents which may occur in occur in information system failures. It is a plan for rapid recovery from the disaster or the emergency response so that the organization does not perceive the impact given by the information system failure.

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## Adaptation of Agonist and Antagonist Muscle Response to Assistive Force In Diferrent Age Group.

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**Keywords:** Assistive technology, Electromyogram, Isometric contraction, Perceived exertion

Improving motor skills for elderly is crucial in order to maintain a good quality of life and to ensure independent living which can be realized with assistive technology. The present study investigated the effect of assistive force and perceived exertion (PE) towards agonist and antagonist muscle activation. Ten young and twelve elderly participants performed 90 isometric elbow flexion while they were acquired to achieve the force target values during 20 workloads for 30 seconds, with three levels of assistive force (0th to the 21st seconds). The rated PE (RPE) were obtained after the task had been completed. The resulted electromyographic (EMG) activities of bicep brachii (agonist) and tricep brachii (antagonist) showed statistically significant decline trend as assistive force levels increase in both age

group. On the other hand, although the young group showed significant decrease in RPE, the trend was not observed in the elderly group. This showed that elderly participants are able to adapt to assistive force similarly to young participants in contrast to their PE.

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## **The Relationship between Perceived CSR and Turnover Intention Private Higher Education Institutions Employees in Klang Valley**

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**Keywords:** Corporate Social Responsibility, Turnover Intention, Higher Education Institution, CSR, Employee Retention.

In this study, the direct relationship between perceived Corporate Social Responsibility (CSR) namely: philanthropic, ethical, legal and economic responsibilities were investigated. It aims to see how these perceived CSR influenced employees turnover intention within private higher education institutions in Klang Valley. A total of 270 records were used for further analysis, with a 96.8usable data. Frequency distribution, reliability analysis, descriptive analysis, Pearson correlation analysis and multiple regression analysis were conducted to analyze the data. Results showed that only two of the perceived CSR are significantly influence employees turnover intentions which are philanthropic responsibility and ethical responsibility while the other two of the perceived CSR (legal responsibility and economic responsibility) are not significant. The findings of this study may benefit not only private higher education institutions, but also could benefit the public universities in designing CSR activities that could attract future employees and retain existing employees.

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## **Evolution of the Leading Edge Vortex Over a Flapping Wing Mechanism**

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**Keywords:** Micro air vehicles, leading-edge vortex, Aerodynamics

Leading-edge vortex governs the aerodynamic force production of flapping wing flyers. The primary factor for lift enhancement is the leading-edge vortex (LEV) that allows for stall delay that is associated with unsteady fluid flow and thus generating extra lift during flapping flight. To access the effects of LEV to the aerodynamic performance of flapping wing, the three-dimensional numerical analysis of flow solver (FLUENT) are fully applied to simulate the flow pattern. The time-averaged aerodynamic performance (i.e., lift and drag) based on. The effect of the advance ratio to the unsteadiness of the flapping wing will result in the flow regime of the flapping wing to be divided into two-state, unsteady state ( $J < 1$ ) and quasi-steady-state ( $J > 1$ ). To access the benefits of aerodynamic to the flapping wing, both set of parameters of velocities 2m/s to 8m/s at a high flapping frequency of 3 to 9 Hz corresponding to three angles of attacks of  $\alpha = 0^\circ$  to  $\alpha = 30^\circ$ . In this research, the results had shown that in the unsteady state flow, the LEV formation can be indicated during both strokes. The LEV is the main factor to the lift enhancement where it generated the lower suction of negative pressure. For unsteady state, the LEV was formed on the upper surface that increases the lift enhancement during downstroke while LEV was formed on the lower surface of the wing that generated the negative lift enhancement. The LEV seem to breakdown at the as the wing flap toward the ends on both strokes.

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## Evaluating Southeast Asian Military Camouflage Design using Camouflage Similarity Index (CSI)

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**Keywords:** Military camouflage, Southeast Asian military, camouflage similarity index, color design.

Camouflage plays a critical component of a military combat uniform. The purpose of this study was to evaluate the existing military camouflage effectiveness across Southeast Asian countries using Camouflage Similarity Index (CSI). CSI value ranges from 0 to 1 and the best value 0 is achieved if the selected camouflage perfectly blends with the selected background. Ten existing military camouflage across Southeast Asian countries were evaluated under seven different locations ( $20 \times 50$  pixels) from one selected woodland background. Each location had different  $L^*$ ,  $a^*$ , and  $b^*$  values. Post-hoc Tukey test showed that there was no significant difference between camouflage, indicating that the existing Southeast Asian Military camouflage had equal effectiveness of concealment on the selected woodland background. This study represents the first attempt to investigate the effectiveness of Southeast Asia military camouflages and the results of this study could be very beneficial for

Southeast Asia military organizations, academicians, and camouflage manufacturer in terms of finding the enhanced direction from the current design.

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## **Investigation of the Ergonomic Risk Factors Among Male Workers in a Medical Manufacturing Company in Northern Malaysia**

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**Keywords:** ergonomic risk factors, ergonomic assessment, manual material handling, manufacturing industry

The medical manufacturing industry is currently one of the sectors with great potential growth in Malaysia, which offers numerous job opportunities to local and foreign workers. The growing proportion of workers in this industry means that a large number of workers are potentially exposed to ergonomic risk factors at the workplace, which may consequently affect their health. Thus, this study was carried out is to investigate the ergonomic risk factors and the prevalence of musculoskeletal disorders among male workers in a medical manufacturing company in northern Malaysia. Eight industrial workers ( $n = 8$ ) were recruited from two Plastic Technology (PT) departments to participate in this study. Observations were made by recording the participants performing two tasks (manual lifting of containers and bags of chemicals) using a video camera at the PT1 and PT3 departments. The participants personal information and their job-related characteristics were first collected using a demographic questionnaire. Next, the Cornell Musculoskeletal and Hand Discomfort Questionnaire (CMDQ) was used to evaluate the prevalence of musculoskeletal disorders among workers while Manual Handling Assessment Charts (MAC) were used to assess the most common risk factors during the lifting operations. The results showed that the highest prevalence of musculoskeletal disorders among the male workers at the medical manufacturing company was at the lower back (83.17%), upper back (4.38%), right shoulder (3.49%), and left shoulder (3.49%). Based on the results of the MAC, 100% of the participants were at high risk of injury from postures in the vertical lift zones, torso twisting, and sideways bending. In addition, 87.5 and 62.5% of the participants were at high risk of injury based on their hand distance from the lower back and grip on the load, respectively. The results of this study can serve as a guideline to implement interventional ergonomics programmes at the workplace and improve the musculoskeletal health of workers in the medical manufacturing industry in Malaysia.

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# Safety Climate, Safety Motivation, and Safety Knowledge in SMEs: An Insight of Workers Safety Compliance and Safety Participation

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**Keywords:** safety compliance, safety participation, safety climate, safety motivation, safety knowledge, SMEs.

Safety behavior is a crucial thing that must be considered concerning accidents in the workplace. Work accidents in the workplace are mostly caused by unsafe behavior. Unsafe behavior can be expressed based on the level of safety compliance and safety participation of workers. Several studies related to safety behavior in Small and Medium Enterprises (SMEs) have been conducted. However, studies related to the integration of person-related factor and situation-related factors are rare. The purpose of the study is to observe the safety climate (as a situation-related factor), and safety motivation and safety knowledge (as person-related factors) toward safety compliance and safety participation in SMEs. This study was conducted in 18 Indonesian SMEs metal manufacturing, and a self-administered questionnaire was utilized as a research instrument. Partial Least Squares Structural Equation Modeling (PLS-SEM) is used to evaluate the effect of safety climate, safety motivation, and safety knowledge on safety behavior. The results show that safety climate and safety knowledge positively significant influence both safety compliance and safety participation. However, safety motivation has positive significant influences on safety participation only. The implication of this result is discussed.

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## Increasing Blink Rates: Reducing Dried Eye Symptoms With Eye Rest-Break Application

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**Keywords:** blink rates, rest break, dried eye symptoms, HCI

Long working hours with video display unit without appropriate breaks could drain the eyes. This study intends to investigate the efficiency of eye rest-break

application to reduce dried eye symptoms by increasing blink rates. Blink rates and dried eye symptoms score among laboratory workers before and after the implementation of eye rest-break application were compared. The numbers of blink rates were recorded for 5 minutes through webcam without the knowledge of the subjects. Then, the Ocular Surface Disease Index (OSDI) was used to measure the dried eye symptoms. For eyes rest-break, EyeLeo<sup>©</sup> application was used. It is computer application that gives reminders to video display unit (VDU) users to take short breaks for their eyes. Six laboratory workers who are constantly working with VDU were selected as subjects. Data was analyzed using Wilcoxon Signed-Rank Test, to test the comparison between variables before and after intervention by reporting its median (inter quartile range, IQR). The findings showed that the median after intervention (39.5, 10) is significantly higher (p-value = 0.028) than the median before intervention (7.3, 3). As for dried eye symptoms, median for Ocular Surface Disease Index after intervention (27.9, 8.9) is significantly lower (p-value = 0.027) than the median before intervention (36.5, 9.4). As a conclusion, application such as EyeLeo<sup>©</sup> eye rest-break is a potential intervention and may be used to increase blink rates and reducing dried eye symptoms among visual display unit workers.

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## Muscle Contraction During Maneuvering Steering Wheel Using Surface Electromyography

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**Keywords:** ergonomic, driving posture, steering wheel, surface electromyography, muscle contraction

Driving posture is one of the factors that need to be emphasized in ensuring drivers comfort and to avoid road accidents and injuries. Meanwhile, fatigue has a strong relationship with comfortable posture and it contributes 15.7% to reduce driving concentration and performances, thus increases the risk of road accidents and injuries. In order to determine the drivers comfort, this study had measured muscle contraction using the objective measurement for comfortable and optimum driving posture angles. The equipment used for conducting objective measurement on 14 respondents was sEMG. The researcher had used sEMG equipment to evaluate muscles activities at upper extremities, which comprises of Biceps Brachii (BB), Deltoid Anterior (DA) and Trapezius Upper (TU) that were involved during controlling the car steering. It involves three driving postures parameters according to the fixed elbow and shoulder angles. The results from this study showed the BB muscle increased positively when turning the steering wheel to the right within 3 to 6 times

value increased. Meanwhile, DA and TU muscles experience a contraction in the opposite direction with steering wheel turning action, which shows higher right side DA and TU muscle contraction when the driver turn the steering to the left with around 80% decrease for DA and within 60% to 80% decrease value for TU. BB muscle also shows an increasing value of muscle contraction with higher elbow flexion, meanwhile DA and TU muscles contraction also show an increment in-line with greater shoulder abduction. The results showed that posture B with elbow angle at  $36^\circ$  and shoulder angle at  $134^\circ$  are the most comfortable driving postures, hence the lowest muscle contraction value of  $15.67\mu V$  (BB),  $19.31\mu V$  (DA) and  $12.36\mu V$  (TU) compared to the other two measured postures. The results of muscle contraction from this study is capable of assisting researchers and car manufacturers to understand the relationship of steering maneuvering when developing more comfortable and suitable vehicles driver seat compartment.

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## **A Review of Accidents Incidents on Boeing and Airbus Commercial Aircrafts Avionics-Related System in Two Decades (1996-2015)**

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**Keywords:** Human error, aircraft accidents, incidents, avionics, instrumentations

Air transportation has been known as the safest mode of transportation since its rate of accidents is relatively very small compared to other accessible modes of travelling. This is possible due to stringent regulatory requirements, as well as the growth of technological advancement on aircraft systems. Nevertheless, aircraft accidents still hit the news, jeopardizing many lives. Hence, one of the objectives of this study is to plot the time-based graph of aviation accidents, which has direct consequence from avionics instrumentations within the period of two decades, from 1996 to 2015. The second objective is to analyse two main aircraft manufacturers, Boeing and Airbus, in determining specific model of its kind that significantly involved in avionics-related instrumentation as one of the contributing factors that leads to the incidents or accidents. The third objective is to identify which avionics system that most frequently involved in aviation incidents, for both manufacturers. The final objective is to examine the main probable cause that has the highest percentage in those accidents within the said time frame. The method of collecting data is by cross-referencing secondary data from reliable official websites of four well-known bodies such as National Transportation Safety Board (NTSB), Federal Aviation Administration (FAA), Aviation Safety Network and Flight Safety Foundation. Results show that misfortune occurrences are directly associated with avionics within the said two decades, which mainly involved Autopilot and Flight Management System (FMS) (14% each), meanwhile the aircraft model Boeing 737 carries



the highest percentage of avionics-related incidents or accidents. Nonetheless, 67% of the misfortune occurrences within the scope of study are mainly due to human error instead of technology. In conclusion, despite the modern technology imbedded in the aircraft system, human elements still represent the leading cause in aviation mishaps.

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## **Review on bio-inspired algorithms approach to solve assembly line balancing problem**

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**Keywords:** Bio-inspired algorithms, assembly line balancing problem, manufacturing, optimization.

Bio-inspired algorithms that have been developed by mimicking the biological phenomenon of nature have been widely applied to solve many real-world problems. For example, memetic algorithm, EGSJAABC3 to optimize economic environmental dispatch (EED), Hybrid Pareto Grey Wolf Optimization to minimize carbon and noise emission in U-shaped robotic assembly line and Polar Bear Optimization to optimize heat production. The results obtained from their research have clearly portrayed the robustness of bio-inspired algorithms to solve complex problems. This paper highlights the efficiencies of bio-inspired algorithms implemented in solving assembly line balancing problem. Assembly line balancing problem is very crucial to solve since it involves minimizing the time of the machines and operators or cost that required optimal task distribution. The outcome of this paper shows the effectiveness of bio-inspired algorithms in solving assembly line balancing problem compared to traditional method.

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## Evaluation of Universal Design Requirements Application in Public Mosques in Bandung

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**Keywords:** public mosques, universal design, facilities accessibility, bandung

Numbers of studies have shown findings on cases of facilities in public buildings that is inaccessible by users visitors with different abilities. Thus, producing user friendly and barrier free architecture-interior design is necessary in the built environment. This research will evaluate the requirements for ease of access in public mosques with study cases Pusdai Mosque Grand Mosque of Bandung in accordance to regulations of the Ministry of Public Works and Public Housing of the Republic of Indonesia No.14 2017. The regulation regulates the provision of facilities in buildings and environments that suit the needs of all age groups, conditions of physical; mental; and intellectual; or sensory limitations based on the buildings function to provide user and visitor convenience in doing activities in the buildings. Both mosques, the Pusdai Mosque and Grand Mosque have not fulfilled standard of universal design in the interior in term of ease of access, safety and autonomy of space use, safety and security for all. From 7 universal design standard requirements, both mosques of study case only fulfill less than 50% of the requirements.

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## Improvement of Storage System Upright Piano Cabinet Using Class Based Storage

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**Keywords:**storage system, piano, class based storage, production planning

The objective of this research is to reduce the process distance on storage and retrieval (S/R) by suggesting storage system of pianos cabinets (pianos parts) on the certain storage shelf. The object of the research is Department of Setting Cabinet that obligated to bridge and organize cabinets supply from Department of Painting to Department of Assembly. Based on the planning and actual delivery of piano cabinets to Department of Assembly, it is found that only 33,3% deliveries were accomplished as recorded by data on April 2018. One of the causes is internal

handling problem at the department of Cabinet Setting that takes longer time due to unorganized cabinet storage. After all data of in-out stock are resumed, later it will be processed by employing class-based storage method for materials grouping. The data indicated that cabinet with material class A is dominated by top 4 requested models of piano and the comparison between initial storage system layout and the proposed one shows the difference on total distance of retrieval activities for 210 kilometers during 5 months of working. It could be concluded that the purpose of storage system could reduce the retrieval distance by 68%.

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## **Integration of Employees Turnover Models in Assessing the Impact of HRM Practices on Behavioural Intentions**

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**Keywords:**HRM Practices, Behavioural Intentions, Higher Education Institutions, Non-Academic Staff, Turnover Models, Intention to Stay.

Grounded by several turnover models and combined with the Herzbergs Two Factor Theory, this study proposed a framework linking Human Resources Management (HRM) practices and intention to stay. The need to analyse the factors affecting employees intention to stay, especially of the non-academic staff in Malaysian Private Higher Learning Institutions (PHLIs) is pertinent because the findings would be able to assist the universities to have better insights on what they should do to retain their competent workforce. Data for this study were gathered through survey questionnaires and this study specifically examines the perceptions of the non-academic staff from the professional and management group of selected PHLIs. The findings revealed that from the four HRM Practices components, only Training ( $\beta = 0.30$ ,  $p < 0.001$ ) and Performance Appraisal ( $\beta = 0.21$ ,  $p < 0.001$ ) were found to have direct relationship in influencing their intention to stay. Thus, to entice them to stay longer, PHLIs should enhance their Training and Performance Appraisal processes. Finally, the findings from this research initiative is expected to support governments efforts in raising the standard of quality education, as well as in creating the international higher education brand for Malaysia through the development of quality human capital.

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## Cashless Society: Readiness of SME to Implement Mobile Payment System

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**Keywords:** Mobile Payment System; Cashless Society; TOE framework; SME

The rapid development of mobile communication technology resulted in a new approach to mobile-commerce. Mobile commerce can be defined as the usage of mobile devices for trading purposes, including mobile banking, payment and finance. Existing payment system is expected to face a disruptive innovation in payment service. Small and Medium Enterprises which rely on the cash flow is expected to face a disruptive via this emerging technology. In Malaysia, the Central Bank of Malaysia has outlined a 10-year e-payment roadmap towards a cashless society. Hence, this study aims to identify the readiness and factors of the implementation of mobile payment system by SMEs in Malaysia. Technology, Organization and Environment framework is used to investigate the factors that motivate the SMEs to implement mobile payment system in their businesses. To achieve the objectives of this study, a total of 162 SMEs have participated in the survey. The results indicated that all dimensions in the Technology, Organization and Environment framework are significant to the implementation of mobile payment system by SMEs in Malaysia. For the key determinants, security concern, relative advantage and top management support are the top three factors affected the SMEs in making a decision to implement mobile payment system in their businesses.

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## Modeling and Simulation of Manufacture Sector Data in Malaysia with Detection of Outliers: an ARMA-GARCH Approach

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**Keywords:** manufacturing, outliers, modeling, simulation, ARMA-GARCH

Manufacturing is one of the major sectors that contribute to the economy of Malaysia. The situation of manufacturing sales, especially rubber gloves received the attention of investors to forecast. However the pattern of economics exposed to unexpected changes, which called outlier which occurred because of internal or external factors. The presence of outliers in time series data will give significant impact

on the modelling and forecasting performance. The approach in this paper is Autoregressive Moving Average-Generalized Autoregressive Conditional Heteroscedasticity (ARMA-GARCH) model. The intention of this research is to investigate the effectiveness of the volatility financial model with the presence of outliers via Monte Carlo method. Besides, to find the best ARMA-GARCH model there are four models produced from different specifications in ARMA(m,n) and GARCH(p,q) models. In this paper, we used 216 monthly price data of Standard Malaysian Rubber Grade 20 (S.M.R 20) in Malaysia. The validity comparison of diagnostic checking is measured on AIC, AICC, SIC and HQIC. While the forecasting performance evaluated using MSE, RMSE and MAPE. The results of the empirical analysis indicate that the ARMA(2,0)-GARCH(1,2) model is the best model to forecast the price of S.M.R 20 that were used to the manufacturing of rubber gloves in Malaysia.

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## **Influence of Yarn Structural Parameters On Cotton/Kenaf Blended Yarn Characteristics**

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**Keywords:** Kenaf fiber, kenaf yarn, kenaf/cotton blend, spinnability, alkalization, Malaysia

Spinning kenaf fibers into yarns are challenging due to the stiffness and lack of cohesiveness of the fibers. Alkali treatment is known to remove hemicellulose, wax, and breaks down lignin, reducing stiffness of kenaf fiber and improving its spinnability. The influence of yarn structure on the spinning process and quality of yarn was extensively studied. NaOH 4% and 6% treatment was carried out prior to the kenaf/cotton mixing process at the weight fraction ratio of 40:60 and 50:50. A full factorial design of experiment was designed in order to evaluate these relationships, the combination of material and process factors i.e. different percentages of kenaf treatment, different kenaf/cotton ratio and twist level. The responses were measured in terms of carding waste percentages and yarn strength. The results showed that kenaf treated at 6% produced the best quality yarn with highest tenacity at the twist of 8 twist/cm. The best combination of the process parameters was established in order to produce the desired yarn quality.

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# PRELIMINARY ANALYSIS OF HYBRID LAMINATE COMPOSITE FOR AIRCRAFT RADOME APPLICATION

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**Keywords:** Finite element analysis, ESAComp software, flax fibre, hybrid composite laminate, aerospace structure

This paper depicts the preliminary analysis of hybrid laminate composite to determine the optimal number of layers for aircraft radome application. In this work, the ESAComp software was used to predict the displacement of hybrid laminate composite under wind load during the flight operation on the aircraft radome. Flax fibre, glass fibre and epoxy resin were applied as the hybrid composite laminate design. Each of the material properties was obtained from the technical data sheet and used as input value for ESAComp simulation. In fibre/matrix micromechanics analysis, a single ply with 20%, 30% and 40% fibre content ratio was calculated to determine the value engineering constant. The value of engineering constant of single ply for each material was then used for the laminate analysis. The laminate construction consisted of flax as the center laminate and sandwiched between glass fibre. Both fibres have the same weave pattern which is twill 2/2 and 200 gsm. The number of laminate layers is 4, 6 and 8 layers. The panel with the size of 300 mm x 300 mm was fixed on each edges and under aerodynamic pressure load plus safety factor of two. Based on the result of the analysis, the minimum number of layer required is at least 6 layers if acceptance displacement is 0.1 mm. However, experimental work on 6 layers hybrid laminate has to be carried out to validate the result and also other requirements toward aircraft radome application.

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# Analyzing the Robustness of the TSP Matrices with Unique Characteristics: A Combinatorial and Linear Programming Approach

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**Keywords:** Travelling Salesman Problem; Robustness; Combinatorial; Linear Programming; Kalmanson

The recognition of special combinatorial structures of Kalmanson matrices in a TSP matrix will facilitate in finding a master tour which can guarantee the robustness of the TSP solution. This study aims to analyze the robustness of the TSP matrices on instances of different characteristics. To be specific, two types of characterization are defined: distribution of the data which are uniform and clustered, and size of the data which are small and large. For this purpose, the Solomon data sets, particularly C1 and R1 are selected for the analysis due to the fact that they possess the said characteristics. Both data sets consist of 100 points in which the distances between points are computed using Euclidean formula. The robustness of the TSP instances was tested using two algorithms developed based on combinatorial and linear programming (LP) approach and the comparison of the algorithms performance is then made. Computational experiments show that LP approach outperforms combinatorial approach despite the difference in the distribution and size of the data. This supports previous findings that LP approach consistently provides the best lower bounds to the TSP.

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## How workplace condition affects healthcare worker: assessment at tertiary hospitals

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**Keywords:** workplace assessment, healthcare worker

Complaint of pain due to work related musculoskeletal disorder at workplace is nothing new. Nevertheless, in Malaysia, the data leading to this is near to none, when healthcare industry is concerned. The purpose of this article is to evaluate the current physical condition at red zone of accident and emergency department

at selected hospitals and has the current condition contribute to the work related musculoskeletal disorder among healthcare personnel. The study is conducted at five red zones of accident and emergency department of Malaysia tertiary hospitals. Before conducting the study, ethical approval has been obtained from ethical committee of Kementerian Kesihatan Malaysia. Method used in this study is workplace assessment, which allows first hand experienced to determine and evaluate the real condition of red zone at selected hospitals. Duration of twelve months is required to complete the assessment. During the workplace assessment, the lighting at red zone (focusing on bed area), the bed space, arrangement of equipment and height of monitors are observed, measured and recorded. Result show, every red zone is unique with is own layout and design. There is no standardization among all the red zones involved. Existing guideline for physical condition of red zone of accident and emergency does not exist. Thus, relationship between physical condition of existing red zone and whether it causes work related musculoskeletal disorder must be discussed in length.

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## **Modeling and simulation of three-roll bending process of bimetal Circular Billet**

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**Keywords:** Three-roll bending, finite element modeling.

Bending process is an important metal forming technique which is used on industrial scale. An asymmetric three-roll bending is sub-type bending process and has a simple configuration. The present study has focused on the investigation of the bonded bimetal billet. The two material consist of copper alloy rod inside an aluminum alloy (AA 6061-T6) tube with one common dimension between the rod and the tube which is the radius of rod and the inner radius of tube. The effect of varying the radius has considered on this study. The results shown that the increasing of copper alloy radius increased the reaction load and the mass of the bimetal billet with exponential increment.

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## Ergonomic Display Design for Bus Route

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**Keywords:** Display, Information, Ergonomics, Axiomatic Design, Bus Route.

Public transportation is one of the most important services in supporting the smooth running of community activities in cities where people most commonly use a bus to reach a destination. Consequently it requires a clear travel route so passengers find it easy to go on a trip. Display is a device for providing information. However, the existing display receives some complaints where more than 60% of passengers experience difficulty in reading what is shown, taking more time for them to understand the information. It is evidence that the device is not effective and efficient to use. Thus development of a new display is crucial. The purpose of this study was to design an innovative display that is more ergonomic in displaying bus route information. Survey was conducted to identify user requirement. Axiomatic design method was applied to determine the design parameters of the display by mapping process from customer attribute and functional requirement on the basis of the ergonomic principles. Statistical analysis was conducted to test hypothesis. The result of this study showed that the display developed is valid to meet customer criteria at 5% of significant level, covering the criteria of being informative (0.144), comfortable (0.063), digitalized (0.070), and easy to access (0.378). Thus, it is more effective and efficient for passengers to gain any information needed.

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## PERFORMANCE MEASUREMENT USING SUPPLY CHAIN OPERATION REFERENCE MODEL (SCOR): A CASE STUDY IN A SMALL MEDIUM ENTERPRISE IN INDONESIA

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**Keywords:** Performance metric, Supply chain performance measurement, SCOR, SME

Nowadays, measuring supply chain performance is a topic that attracts many researchers. Performance measurement can be used as a reference to improve performance in order to compete in the market. This study aims to measure the supply chain performance in a small and medium enterprise (SME) producing sports clothes in Yogyakarta. This research utilizes the performance attributes from Supply Chain Operation Reference Model (SCOR). The business process is identified as the

baseline to determine performance metrics on each process (plan, source, make, deliver, return and enable) and performance attributes, i.e. reliability, responsiveness, agility, cost, and asset management efficiency. According to the experts within the company, there are only 27 of 40 performance metrics obtained valid. The overall performance score is at a good level with the value of 77.89. Among the metrics, it is found 9 metrics in marginal and average level while the remaining metrics gained the value of more than 70. This supply chain performance analysis can support the company decision making in order to improve its performance at an excellent level.

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## Identify Key Success Factors Using Interpretative Structural Modelling (ISM): A case study in A Small and Medium Enterprise in Indonesia

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**Keywords:** Key success factors, Interpretative Structural Modeling (ISM), Small medium Enterprises

Small Medium Enterprises (SMEs) have a very significant role in the economy of the community. The large number of SMEs on the same field causes high competition to survive in market. A lot of literature empirically discuss the success factors of SMEs in Indonesia, but there are still few which carry out further research by structuring a model of interconnectedness between these elements to find out the key factors. This study aims to determine the key factors by classifying and structurally modelling the factors based on the level of the affecting elements of an SMEs success. Interpretative Structural Modeling (ISM), which is an interactive learning process where a set of elements are structured into a comprehensive system model, is used as the approach. ISM helps in determining the sequence and purpose of complex relationships between elements in the system. This research found 24 success factors that divided into 13 levels and categorized into 4 sectors including autonomous, dependent, linkage, and independent sector. The sub-elements or key factors that influence the success of SMEs include (1) motivation and experience, (2) entrepreneurial spirit and leadership, (3) formal education level, and (4) technical guidance.

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## Ageing drivers mental workload in real-time driving task based on subjective and objective measures

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**Keywords:** Ageing drivers, mental workload, NASA-TLX, Electroencephalogram

The ageing drivers population is increasing rapidly and they are exposed to disabilities due to degenerative processes, thus affecting their driving performance. The main objective of this study is to determine the mental workload of ageing drivers while secondly is to compare between the mental workload of the ageing drivers and the control group. The methodology consisted of on-the-road experimental driving tasks consisting three level of situation complexity. The NASA-Task Load Index (NASA-TLX) and Electroencephalogram (EEG) was measured on thirty drivers. The NASA-TLX scores revealed that the ageing drivers mean physical demand score was the highest compared to others in moderately complex situation and very complex situation; scoring 37.25 and 43.50 respectively. Meanwhile, for Electroencephalogram signals fluctuation, results showed that situation complexity had significant effects on RP and RP of channel locations FZPZ and O1O2. It is evident that there is a significant difference in the weighted workload scores for the ageing drivers and control group in the simple situation while there was no significant difference found in the RP and RP band at all channel locations. The findings would be beneficial as a guideline for designers, manufacturers, developers and policy makers in designing better driving environment for ageing drivers.

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## Whiplash Injury Mechanisms of Car Rear Occupants

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**Keywords:** Whiplash, impact, head, neck, head restraint (HR).

Whiplash injury due to low severity vehicles crash is a global problem. The injury has long-term clinical and biomechanical implications. Since the mid-1960s, injury statistics have continuously revealed that females face a higher risk of suffering the injury category compare to males. Besides, in a frontal crash, the injury measures from the adult rear dummies were mainly higher than the same size dummies located in driver and front occupant seat. However, most regulations and user crash tests have focused on vehicle drivers and front seat passenger due to high occupancy and mortality rates in the front seat. In this paper, mechanisms of whiplash injury were

studied to contribute a further inclusive understanding of human impact reaction, variability quantification, validation, and prevention. The objective of this study is to identify the important head restraint (HR) characteristics. In order to raise consideration whiplash injury and prevention mechanisms, impacts are simulated with computer modelling (Ls-Dyna simulation) and validated using Matlab. Therefore, these injury mechanisms indicate the development of new anti-whiplash technology in the automotive safety area is necessary.

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## Effect of Auditory Distraction on Hand and Foot Reaction Time among Ageing Malaysian Automobile Drivers

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**Keywords:** auditory distraction, CLL, ULL, phone call, hand reaction time, foot reaction time.

The involvement of ageing drivers in traffic accidents were reported but little cited on the severity of auditory driving distractions. Driving distraction contributes to increases in reaction time which can lead to safety traffic risks. Thus, in this study, hand and foot reaction times were measured in response to different distractions within the identical simulated driving route. The task varies in a control setting where soundless distractions were present, Comfortable Loudness Level (CLL), Uncomfortable Loudness Level (ULL) auditory distractions, and phone call distraction. Participants were among 40 Malaysian driving license holders consists of 57.5% males and 42.5% females with age mean, (M=51.83, SD=14.058). Results indicated that both hand and foot reaction time were shortest for CLL and longest during phone call. Ageing male scored shortest hand reaction time of 1.15s and longest of 1.40s. For foot reaction time, ageing male scores shortest of 0.92s and elderly male scores longest of 1.25s. Pearsons coefficient of correlation shows  $r > 0.5$ . The results indicated hand reaction time was affected by foot reaction time ( $r = 0.665$ ), was significantly more for foot when compared with hand, could be because of difference in nerve conduction velocity and movement time of the hand when compared with that of foot.

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## **Ergonomic Engineering Intervention of Batik Stamping Work to Reduce Lifting Load**

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**Keywords:** ergonomic, comfort posture, engineering approach, WMSD, postural load

One of the common health problems for small and medium enterprise such as batik production is work-related musculoskeletal disorder (WMSD). This health problem may contribute to long-term medical effect on the production workers. For batik stamping workers, the load of the copper block that need to be handled can reach up to 2kg which need be used in repetitive working movement. This study is aim to reduce the WMSD effect by reducing the lifting load of the cooper block handled by the batik stamping worker. The workers working load is observed before the intervention process by using one of the ergonomic risk assessment tools that is the RULA analysis. The ergonomic intervention designed in this study is from the engineering approach by modifying tools. It is found out that the intervention done were able to eliminate the lifting load handled by the worker to avoid discomfort or further health complication. This outcome are hoped to be able to improve workers health and increase batik stamping working productivity that eventually increased companys revenue.

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## **Professional Skills Needed among Mechanical Engineers in Malaysia Based on MoE: Using Discriminant Analysis**

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**Keywords:** Professional Skills; Mechanical Engineers; MoE; Soft Skills Model; Discriminant Analysis

Professional Skills is the basic requirement that all engineers need to master in the current job market. This study was conducted throughout peninsular Malaysia using the Soft Skills Model introduced by the Ministry of Education (MoE). Among the objectives of this study are i. what is the level of requirement of the Soft Skills (SS) element to produce a competitive Mechanical Engineer?; and ii. identify the

most dominant Soft Skills needed in the current job market against Mechanical Engineers. The questionnaire distributed to respondents and data was analysed using XLSTAT2014 software to obtain Discriminant Analysis (DA) to achieve the objective of the study. The overall percentage for (SS) elements is 90.74% respectively. This study will be a complementary set for the students of Mechanical Engineering in Malaysia. Mastering the features required by the industry makes it easy for students to put themselves in the real job world.

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## Critical Thinking and Problems Solving Skills among Mechanical Engineering Students

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**Keywords:** Critical Thinking, Problem Solving, Mechanical Engineering, Soft Skills, Higher Order Thinking Skills.

Engineering Education is a course that emphasised on soft skills that are related to critical thinking and the ability in solving problems. Creative and Critical Thinking Skills (CCTS) is a type of skill that is deeply emphasis in the education system. It starts in primary school. Recently, all the exam questions in a primary, secondary schools and public universities oriented to the principle Higher Order Thinking Skills (HOTS) in (RMK 11 - Transforming Education System). The objective of the program is to produce students that are more competent in solving problems by using various forms of knowledge that had been studied theoretically to apply it effectively. This study aims to examine the extent to which the needs of elements of critical thinking and problem- solving skills to produce competitive engineers from industries point of view. Feedback from respondents was taken through quantitative methods using a set of questionnaires. A total of 300 respondents have participated in this study. The study is expected to be a guide for future mechanical engineers who would be involved in accordance with the requirements of the mainstream industry.

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## **Design and Development of Ergonomic Table and Anaylze using RULA Analysis**

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**Keywords:** Musculoskeletal Disorder, Design and Development, RULA.

Ergonomics and design have made the greatest relation in producing an artifact or creating a workplace. A Computer table is widely used in classrooms in universities. However, the problems of the current computer table have been detected through the results of RULA analysis. In this research, a survey of the questionnaire was done and also the anthropometric data have been collected. The dimensions of the current computer table are then collected and the deficiencies of the current computer table have been focused on RULA analysis. A new structural design of the computer table has been designed, in order to make it meet the requirements of ergonomics. A product of the new design of ergonomics computer table is made and has been focused on RULA analysis to define the improvement between both tables. The paper showed a comparison between the current computer table and the new ergonomics computer table were analyzed. The improvement of the new ergonomics computer table was identified and reduced the injuries and disorders. A further investigation on better working posture when using a computer table is required, while further improvement for the product design of a new ergonomics computer table is needed, and then applying the ergonomics design aspect in our life.

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## **Effect of Using Electronic Map While Driving on Human Error Probability**

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**Keywords:** Human error, Human error probability, Electronic map, Incident, Accident, Driving safely.

Applications of electronic map from mobile phone have helped drivers finding travel destinations. These applications often used by driver as guidance when he was driving. There were some factors caused traffic accident that endanger individuals. Among these factors, human error was the main factor that caused traffic accidents. This research aims analyzing the effect of using electronic maps while driving on human error probability. This research used goggle map application as secondary

task on driver. Human Error Assessment and Reduction Technique (HEART) were used to analyze human error probability and its output be compared to drivers shelves report. The value of human error probability when using electronic map while driving is 0.096. According to driver subjective judgment, 0.062 respondents experienced on accidents and oftentime respondent had experience near accident or incident (probability = 0.206). For the other drivers, using the electronic map can impede their vehicles and gave wretched conditions, 0.50 respondents said they got a warning from another driver because he inhibited the traffics. A procedure driving safely while using electronic map have designed to minimize accident and protest from others driver. This research concluded using electronic map when driving increased human error probability and increased the accident.

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## Human Factors Analysis of Online Learning Process for Students in Certain Indonesian Campus (Preliminary Study)

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**Keywords:** human factors, online learning, Indonesia.

The fourth industrial is impacting the learning industry to become online learning, especially in Indonesia. Online learning provides some of the benefits such as cheaper, takes less time, self-paced learning, and a solution to provide equal quality of education to students in rural areas. A total of 60 Indonesian college students on certain campus (age 20 0,36 years old) who joined in Computer Simulation Class in the third grade participated in this study. They are divided into two classes, the online class using Moodle Software and the physical class, then observations are made. This study aims to obtain preliminary data to then research what human factors influence Indonesian people that make students constrained to do successfully online learning. The results, there are three aspects of implementing online lectures in Indonesia, they are rules aspect, usability aspects, and cognitive aspects. Besides, quality of place is an uncontrollable environmental factor that cant be controlled.

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## Validity and inter-rater reliability of postural analysis among new raters

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**Keywords:** new raters, validity, inter-rater reliability, RULA, REBA, OWAS

Work posture analysis is crucial in observing and reducing work-related musculoskeletal symptoms in the workplace. However, in a developing country, new raters are commonly assigned to conduct the postural analysis due to cost-effectiveness reason. The aim of this study is to observe the validity and inter-rater reliability (defined as the degree of agreement among different raters) among new raters of three different commonly used-work posture analysis methods namely Rapid Upper Limb Assessment (RULA), Rapid Entire Body Assessment (REBA), and Ovako Workload Assessment System (OWAS). Fifty Industrial Engineering department students, divided into five groups, who received prior training about the use of the methods, participated voluntarily in this study by observing ten different working postures in five different industries: tofu industry, military equipment manufacturer, automotive maintenance and service, cracker industry, and milk-processing industry. One ergonomics expert also observed the working postures. Validity was observed based on the correlation among new raters ratings with the rating of an ergonomics expert. Inter-rater reliability within one group was calculated using the percentage of agreement and kappa value. The result shows a high validity of RULA, REBA, and OWAS among new raters. There are also insignificant differences in inter-rater reliability among RULA, REBA, and OWAS of new raters. Implications of the result are discussed.

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## Exploring Quality Influencing Factors for Frozen Food Industry

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**Keywords:** Frozen Food, Packaging, Raw material, Storage, Transportation

Quality is the grade of excellence or level of acceptability by the buyers. For the frozen food industry, it can be defined as the composite of those features which have significance in determining the level of acceptability by the consumer. This study was to analyze the relationship between storage, transportation, stock control, packaging, and raw material on the quality of frozen food. The research methodology of this work was a combination of observation and interview, and survey from 55

Malaysian frozen-food small-enterprise. From the findings, only two factors, Packaging, and raw material came to significantly and positively affect the quality of the frozen food. The findings of this study could be an asset for food industries to have a better understanding of the quality control of their products.

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## **ERGONOMIC RISK ASSESSMENT ON SELECTED HOT-WORK WORKERS AT COMPANY XXX**

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**Keywords:** Hot-works, ergonomics, ergonomic risk assessment, awkward postures

Company XXX is a factory that involving manufacturing of offshore containers in where the hot works are one of the crucial activities in fabrication and structuring the framework of the containers. This study had been conducted at hot work section to conduct initial and advanced ergonomic risk assessment to identify ergonomic risk factors involved among hot-work workers which cause the significant number of reports on ergonomic related health issues at hot works area from the year 2011 to year 2017. The initial and advanced ergonomic risk assessment had been conducted based on DOSH latest release of guideline on ergonomic risk assessment 2017 and all findings had been tabulated and analysed. Based on the intial ergonomic assessment, total score achived is 17.7 with main risk factors identified through the hot work acticties are including awkward postures, repetitive motions, static and sustained work postures, vibration, insufficient ventilation, exposure of noise and working in extreme temperature. Based on Advanced ERA conducted on selected 3 workers, the study shows Muscle Fatigue Assessment (MFA) with average score for risk level shown High and Very High categories, Rapid Entire Body Assessment (REBA) with average total score more than 10 which categorized as High Risk and Quick Exposure Check (QEC) which shown the workers have very high risk for back and shoulder or arm parts with score level are between 29 to 40 for back static and 41 to 56 for shoulder and arm parts. Based on results of the assessment, company XXX recommended had been to conduct further investigation for improvements to determine effective control measure for the work process in order to reduce that risk level towards the hot work workers.

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# Mastery of Leadership Skills Among Mechanical Engineers By Industrial Needs

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**Keywords:** Leadership, Mechanical Engineers, Soft Skills, Professional Skills, Industrial Needs, Discriminant Analysis.

Leadership is an essential element of all types of work. This skill is also a focus in the field of Mechanical Engineering. Mechanical Engineers are said to be less familiar with leadership skills, and this will negatively affect the reputation of an industry. They aimed of this study to look at the extent of the need for leadership skills among Mechanical Engineers. The quantitative method used to obtain the study data involves 300 respondents who need to answer the questionnaire. The results show that the elements of leadership skills are at a very high level of need of 88.50%. Therefore, graduates in Mechanical Engineering should be more prepared to prepare for the workplace.

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## IDENTIFYING FACTORS THAT AFFECTING TOURISTS TO CHOOSE SHARIA HOTEL BASED ON THEORY OF PLANNED BEHAVIOR (TPB) USING STRUCTURAL EQUATION MODELLING

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**Keywords:** Theory of Planned Behavior, Structural equation modelling, multivariate analysis, sharia hotel.

Today halal tourism is increasing along with changes in people's lifestyles. One tourist support is the existence of facilities such as hotels. This research was conducted to reveal the factors that encourage tourists to choose sharia hotels. This study uses the Theory of planned behavior (TPB) model with three main variables (Attitudes, subjective norms, perceived behavioral control) with additional modifications in the form of variables from the Pull and push concept and one religiosity variable. The survey was conducted in Yogyakarta, one of the favorite tourist destinations in Indonesia. The total number of respondents was 315 respondents. Based on structural equation modeling (SEM) using AMOS on respondents, the results of two TPB variables were attitudes (Attitude) ( $0.300 < 0.5$ ) and perceived behavioral control (Perceived behavioral control) ( $- 0.022 < 0.5$ ) did not affect consumer

interest in sharia hotels. this research also found that there was a weak influence between religiosity on the three TPB variables. Conversely, the Normative Confidence variable directly influences the variable subjective norm ( $0.708 > 0.5$ ). Likewise the subjective norm variable is directly affected by consumer interest ( $0.705 > 0.5$ ). The findings show that tourists tend to be affected by their social life to choose and visit a sharia hotel is unique. The findings proves that price, location, prestige is not the main consideration for consumers in choosing sharia hotels. There are factors that prevent them from choosing sharia hotels, and these factors are acceptance of the social environment of tourists, whether it is family, friends, role models or society. The findings have several implications for business, policy development, and marketing strategy to improve sharia hotels services quality and revenues.

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## Local Search Algorithm for Solving Periodic Location Routing Problem

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**Keywords:** PLRP, NP-hard, Metaheuristic, Local search, Relocation

This study examines the problem of facility location and vehicle routes determination in supply chain system periodically. The problem is determining the location and route to meet the supply of commodity to the power plant that taken from the case of an electricity company in Indonesia. In this study, the problem is called Periodic Location Routing Problem (PLRP). Periodic Location Routing Problem is a non polynomial hard problem (NP-hard), if locations considered is increase, the computation time used is increasing exponentially. Therefore, to solve a large-scale of this problem, a local search algorithm is proposed. Local search is a very simple metaheuristic algorithm. To explore the solution space for the problem, this algorithm will use the relocation operator. The results of computational experiments from 10 instances indicate that the results of the solution has a small standard deviation with short computing time in less than 2 hours.

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## UniSZA as a National Centre of Design for Disability in Malaysia

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**Keywords:** National Centre of Design for Disability; Tetrachomelia Child; Special Products and Equipment; School of Industrial Design

This paper explains the initial steps of establishing a national centre of design for disabled people in Malaysia. As we all know, there is still no evidence of the existence of a creative industrial product design centre in the country, especially for this special population. Through the initiative from the School of Industrial Design located in Universiti Sultan Zainal Abidin (UniSZA), we take a commitment to channel the societal significances through designing, developing and producing innovative product design for various categories of disabilities in this country, such as physically disability, mentally disability, vision impair, learning disability, speech disability and others. It will be done entirely in a centre known as National Centre of Design for Disability (CDD) which highlights the standards and quality of design where the outcomes meet the satisfaction of the end users through its function, ergonomics, safety, comfort and aesthetics. As well, the end users are not ashamed to join their routine activities in the open public environment. The CDD improves to enhance the existing equipment alongside providing advice and assistance for the state-of-the-art research outcomes.

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## Mapping of Risk Factors for Musculoskeletal Disorders on Construction Workers: A Meta-analysis Study

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**Keywords:** risk factors, musculoskeletal disorders, construction workers, meta-analysis

This study aims to clarify the association between work-related risk factors and musculoskeletal disorders on construction workers. The association was determined from the effect size calculated using a meta-analysis study. Selected publications were obtained through electronic search using Science Direct, Scopus, IEEE explore MEDLINE (Pubmed), Web of Science, and Taylor and Francis Online. After intensive searching screening, a total of ten articles found to be closely related to the study and were selected for meta-analysis. Associations were identified between

musculoskeletal pain and the following risk factors: Body Mass Index (BMI), age, work experience, and awkward posture. Gender, repetitive tasks, grasping small objects, psychological demands, and job dissatisfaction were significantly associated with upper limb pain. Physical unfittness, physical demand, psychological demands, and twisting the back were significantly associated with back pain. Psychological demand was significantly associated with neck pain. This meta-analysis also suggested, compared to individual or psychosocial risk factors, work-related risk factors seem to be easy to understand, and their implications in construction management are discussed in this paper.

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## Simulated Annealing Algorithm for Solving Pickup and Delivery Problem with LIFO, Time Duration and Limited Vehicle Number

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**Keywords:** Pickup and delivery problem, time duration, last-in-first-out, simulated annealing

Nowadays, the process of delivering goods or documents from one place to another can be done faster by utilizing a courier service. This courier must be able to create a travel route to pick goods and deliver them with a short time. Route creation will be more difficult if there is a time window for each customer and the goods being transported are heavy or dangerous items. In this case, the courier company must implement a last-in-first-out rules. In addition, with the limitation of vehicles number, companies have to minimize the number of underserved customers. This problem called pickup and delivery problem with last-in-first-out, time duration, and limited vehicle number. In this study, to solve the problem, simulated annealing algorithm was used for some dataset. To explore the solution space for the problem, this algorithm will use pair relocation operator. In several experiments, the results show a good solution and short computation time.

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# Development of Optimal Air Conditioning Control System with PMV Sensor Unit

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**Keywords:** IoT, PMV, AC control system

In a phase of disaster recovery, victims are forced to dwell contemporary house and manage their health under limited energy use. To realize energy conservation and keeping their own health simultaneously, optimal control of Air-Conditioning (AC) based on PMV is effective. However, conventional PMV measuring devices are not feasible for AC controlling because of expensive, sizable and wired devices. In this study, authors developed AC control system with PMV sensor unit using reasonable sensors and microcomputer board and measured PMV and electricity in winter period to discuss feasibility of the developed system. As a result, a efficiency of the developed system had a same performance of conventional PMV measuring devices and realized energy saving and ensuring of thermal comfort.

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## An Integrated approach for Path Planning for Mobile Robot Using Bi-RRT

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**Keywords:** RRT, Bi-RRT, Path planning

In this paper, an integrated effort has been exploited for path planning along with path smoothness for a mobile robot. An extension of randomly exploring tree is used to plan the path for robot along with path length smoothness. Our proposed system leverages the concept of Bi- directional Rapidly-Exploring Random Trees (Bi-RRTs) for path planning together with path smoothness for minimizing the processing time to search for the path length. We compared our system with standard techniques in experiments with the autonomous robotic platform. Results show that the proposed approach as high robustness and use less computational effort.

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# Job Description Design Based on Business Process Mapping and Workload Analysis Using M-FTE and DRAWS

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**Keywords:** RASCI Matrix, Workload Analysis, M-FTE, and DRAWS

An Indonesian State-Owned Company which works on IT-based projects is experiencing an unbalanced workload among its project teams. This problem causes profit losses due to the overruns of project schedules. This problem is originated from the job descriptions of each position has not been well structured. Therefore, business process mapping is needed to formulate a job description by employing a RASCI (Responsible-Accountable-Support-Consulted-Informed) Matrix. The revised job description is then used as the basis of Modified Full-Time Equivalent (M-FTE) calculation and subjective workload assessment. M-FTE calculation shows the ideal number of personnel needed for a specific position. The subjective workload assessment is also conducted in this study to complement M-FTE calculation. It is conducted by using the Defense Research Agency Workload Scale (DRAWS). Both M-FTE and DRAWS indicate the overload condition of each position. This study recommends adding one personnel for each position.

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## THE PROCESS OF DESIGNING SPECIAL WHEEL CHAIR FOR PEOPLE WITH PHYSICAL DISABILITIES

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**Keywords:** Physically disability, Motorized Wheelchair

There is the need to develop an affordable motorized vehicle for better mobility. The purpose of this study is to seek the appropriate affordable materials to developed affordable motorized wheelchair for better mobility among physical disabilities. The study includes the feasibility study of the existing used wheelchair, the system used and the characteristic of the physical disabilities symptom. To analyse their behaviour through the usability and related functionality. Through the observation, the existing motorized wheelchair uses Stainless Steel as the main structure, using off-the-shelf heavyduty accessories, electrical component, heavyduty battery and Car Pulley system in which the weight accumulates approximately 100 kg. The heavy weight wheelchair cannot be folded and put inside the car. It also



needs to have a special carrier to carry the wheelchair. The field research also been conducted to evaluate the exiting wheelchair system in market with various system used, component, motors and material in the area of technical, usability and comfort before start to redesign the wheelchair. The results of the study would include the background needs of the characteristic of the physical disabilities. The available high-grade aluminium materials will be used to support the mobility and their relevant properties. The design will be done all the way and the specification will be used as an instrument data for the motorized vehicle. The selection of design features, documentation of design procedures result will be used to create a P.O.C (prove of concept) prototype for the meant vehicle. The preliminary prototyping test will be done by user and the data (result) will be used to improvise the wheelchair prototype. The second improvised prototype will undergo the second user testing in the area of reliability, stabilized of system, and ease of used. The results expected will be observed and tested by user to lead towards recommendation of the motorized wheelchair design.

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## **Sleepiness and Daily Sleep of Malaysian Shift Workers in Electronics Manufacturing Industry**

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**Keywords:** sleepiness, shift work, shift workers, sleep, safety, manufacturing, Malaysia.

The purpose of this study was to identify the relationship between sleepiness and daily sleep amount, and its significant associated factors among shift workers of the electronics manufacturing industry in Malaysia. 300 shift workers were asked to respond to a survey on demographic information, sleepiness and daily sleep. Sleepiness was surveyed by using the Karolinska Sleepiness Scale and daily sleep was captured by using sleep diary. A total of 255 employees provided valid data for analysis. To test the hypothesis, statistical analysis was conducted using IBM SPSS program version 24. Sleepiness among shift workers found to be increased by the end of the shift. Around 30% of workers did not have an adequate amount of daily sleep. Sleepiness was found to have significant associations with age, marital status, level of education, time of shift, and working experience. Meanwhile, the amount of daily sleep obtained was only significantly associated with the age of the respondents. There is no significant relationship found between sleepiness and daily sleep of the shift workers. Shift workers in the electronics manufacturing industry in Malaysia were exposed to sleepiness at work and reduction in their daily sleep. This will increase the risk of an accident in the workplace. Appropriate intervention program should be implemented to curb this problem.

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# Supply Chain Performance Measurement Using Supply Chain Operation Reference (SCOR) 12.0 Model: A Case Study in A Leather SME in Indonesia

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**Keywords:** supply chain, performance measurement, SCOR (Supply Chain Operation Reference), leather industry, small-medium enterprise (SME)

The leather industry is one of the basic ingredients in fashion and textile/apparel that has good development potential. This can be used to take advantage of the opportunity for the leather industry which is still importing 60-70%. Supply chain measurement is needed to determine production capability and moreover to benchmark for its company, government, and academics. Measurement of supply chain performance is carried out using the newest-SCOR 12.0 method with a performance and processes approach. The study was conducted on XYZ SME and limited to bag product which is one of the largest leather industries in the Bantul area, Special Region of Yogyakarta. The value of supply chain performance is 54.29, which based on performance indicators. This value included in the average category. It can be inferred as the benchmark for the leather industry around areas to improve supply chain performance.

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## Comparison of Buck-Boost Derived Non-Isolated DC-DC Converters in a Photovoltaic System

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**Keywords:** supply chain, performance measurement, SCOR (Supply Chain Operation Reference), leather industry, small-medium enterprise (SME)

A DC-DC converter plays a crucial role in a photovoltaic (PV) system. Power generated by the PV system is a function of solar irradiation and temperature. Power voltage (P-V) characteristic of a PV module exhibits a single power peak at uniform irradiance and temperature. To operate the PV array at its maximum power point, a maximum power (MP) point (MPP) tracking (MPPT) algorithm is required. The DC-DC converter placed in between the PV array and load, works as an impedance matching circuit. Depending on the application, a suitable selection of DC-DC converter is an important decision. In this study, a comparative simulation analysis of different buck-boost derived non-isolated DC-DC converters are discussed in terms of output power efficiency, output power ripple, and tracking speed. The

converters studied are buck-boost, Cuk, SEPIC, Zeta. To evaluate the performance of each DC-DC converter, a widely used Perturb and Observe (PO) MPPT algorithm is modeled and simulated in MATLAB/SIMULINK.

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## **Task Analysis on Maintenance Worker (Rail Grinder) of Light Rail Transit (LRT)**

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**Keywords:** Noise-induced hearing loss (NIHL), maintenance worker, occupational noise, hierarchical task analysis, ergonomics, railway.

Rail maintenance routines are necessary to enable the all rail operations to achieve its aim in maintaining a safe and efficient operation. The maintenance tasks expose the workers to vibration and noise, as they handle specialized machineries and heavy self-propelled vehicles. Exposure of noise above the permissible exposure limit and over the daily allowable duration may cause noise- induce hearing loss (NIHL). Investigation on the type of task that has high noise level exposure on the maintenance workers was conducted to justify the needs to further detailed of this study. This paper will describe the task analysis on maintenance workers and to identify possible tasks with exposure to high level of noise. It scopes down to grinding crew of the maintenance department of light rail transit. Methods used were real-time sound measurement using a sound level meter, observation and interviews. Then, data were analyzed to understand the situation of exposure of noise during rail maintenance. An ergonomic risk assessment was also conducted by adoption of the latest guideline on Ergonomic Risk Assessment at Workplace Guidelines recommended by DOSH. A hierarchical task analysis (HTA) was generated on the task of the maintenance worker, focusing on rail grinding crew. The newly generated HTA had allowed better understanding about the nature of work and the task conducted by a rail grinder during the work shifts. Tasks involving high noise level was identified. Data recorded shows that the noise level for the blowing activity was relatively high and exceeded the permissible exposure limit of 90dBA. The exposure level was currently controlled by practicing the usage of hearing protection equipment (HPE) and by controlling exposure time in accordance to recommendations of the Factory and Machinery Act (FMA). Thus, it had confirmed that maintenance workers were exposed to high noise levels when performing their daily task. Further studies are needed to investigate the relationship between the duration of exposure and noise- induce hearing loss (NIHL) with consideration of the lifestyles of the maintenance workers.

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## Characterization of Banana peels waste adsorbent for preliminary study of methylene blue removal from aqueous solution

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**Keywords:** Banana peels waste, methylene blue, dyeing wastewater, adsorption study, adsorbent.

This study investigates removal of methylene blue (MB) from wastewater using adsorbent produced from Banana peels waste (BPW). Banana peels waste adsorbent (BPWA) was prepared via carbonization in laboratory muffle furnace for one hour. An optimization study was performed on the adsorption process by varying the initial concentration of MB, adsorbent dosage, contact time, pH and temperature of the aqueous solution. Under the optimized conditions obtained, the maximum percentage removal of MB is approximately 99 %. The potential of BPWA as dyeing wastewater adsorbent was proven by Scanning Electron Microscopy (SEM) analysis, N<sub>2</sub> adsorption-desorption analysis and Fourier Transform Infrared Spectroscopy (FTIR). From the results, the synthesized adsorbent shown a good percentage removal of MB. In addition, the optimum conditions for the adsorption study are 1 g of adsorbent in the 1 g/L of MB initial concentration, for 1 hour at pH 8 in 65 °C. This study reveals potential of BPW in removal of dyes from aqueous solution, and further studies are required to establish the applicability of the synthesized adsorbent for the treatment of wastewater from textile industry.

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## Fractional Order PID Sliding Mode Control for Speed Regulation of Permanent Magnet Synchronous Motor

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**Keywords:** Fractional calculus, permanent magnet synchronous motor, sliding mode control, speed regulation.

This paper proposed a fractional order PID sliding mode control (FOSMC-PID) for speed regulation of permanent magnet synchronous motor (PMSM). Fractional calculus has been incorporated in sliding mode controller (SMC) design to enhance chattering suppression ability. However, design of fractional sliding surface is crucial to ensure speed tracking accuracy is not jeopardized. The proposed controller is designed with a fractional order PID sliding surface, which balances the strength and weaknesses of sliding surface with PI and PD structure in terms of robustness and dynamic performance of the controller. Stability of this controller is analyzed using Lyapunov stability theorem. Simulation results prove that the proposed FOSMC-PID speed controller performs as a robust and fast anti-disturbance controller to regulate the speed of a PMSM and proven its advantages against conventional integer order SMC controllers. It also improves the FOSMC in terms of torque ripple reduction, chattering reduction and anti-disturbance properties, compared to FOSMC with PI or PD sliding surface.

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## Preliminary Study on the Ergonomic Design of Motorcycle Seat for Comfort Usage

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**Keywords:** Motorcycle seat, Ergonomic design, Anthropometric, Comfort, Lumbar support.

Motorcycle seats undeniably provides good comfort to the motorcyclist but there are some that offers less affirmation on bringing comfort and even results in more harm to users, such as back pains, neck, shoulders, and other parts on a longer riding period. This research aims to investigate the discomfort faced by the motorcyclist and the best seat based on ergonomic design for the masses through a subjective evaluation. A study that includes a survey was conducted to study the subjective assessment against the motorcycle seat comfort. The study is divided into two parts, where in parts 1, the anthropometric data were collected from a total of 100 respondents, representing 88 males and 12 females. Mean from the anthropometric data was used for two new seat redesigns, designated Seat A and Seat B. For part 2, sets of questionnaire were distributed to 130 respondents to measure their perception of seat design A and design B. Based on the results produced, 86.2% respondents suffered discomforts while riding a motorcycle. Most of them suffered discomforts at particular body areas: lower back, buttock and shoulder while no discomfort reported around leg, feet and thigh. Results also proved that current seat designs

needed an improvement with a majority of respondents opting an added backrest and to increase surface around buttock area. Based on the evaluation of designs, Seat B was selected as a better option as compared to seat A in terms of comfort usage.

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## Integration of Psychological Capital in a Conceptual Work Productivity Model

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**Keywords:** Psychological Capital (PsyCap), Work-related risk factors, Work Productivity.

Psychological Capital (PsyCap) is a positive construct that deals with the strengths of workers. It has a positive impact on employee performance, psychological well-being and happiness. It is negatively related to job stress, turnover, burnout, and counterproductive work behaviors. There is a need to consider PsyCap while measuring the working performance of the workers working in a highly interactive hazardous environment. The objective of this study is to propose a work productivity model that not only include work-related risk factors that result in acute or chronic responses to the development of WMSDs but also the positive variables (PsyCap) that may support the worker to abate the associated risks. A review of 11 conceptual work productivity models was conducted to identify the gap and the relationships between the components of work productivity model. This study introduced a conceptual work productivity model, that not only integrates PsyCap as positive construct, but also highlights the positive and negative association between management system, work environment and worker that results in either maximizing or minimizing productivity, performance and employee health/ well-being. This study will be helpful to understand the importance of PsyCap in the working environment, to explore the mechanism associated with the management system, work-related risk factors, psychological capital and work productivity.

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## Career Challenges Model among Female Engineers: PLS-SEM Analysis

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**Keywords:** Career challenges, life balance, female engineers, PLS-SEM

The role of women in the career sector has the ability to improve the economic standard of the family institution as well as the local community. Nevertheless, these women are likely to leave the job sector as a result of the crisis between their commitment to the career with the household interest. In response to this issue, this study aims to build a career challenge model that caters the demand among women in the century. Hence, this study has identified the key factors to the challenges faced by female engineers in pursuing their career as an engineer through the Delphi Modified Technique. The result shows this study looking into the relationship between four independent constructs namely life balance, childcare, leaves, and gender discrimination. Meanwhile, the dependent construct of this study is career challenges faces by women. The scope of the study comprises female engineers with families and 211 respondents were selected to answer the questionnaire. The data obtained were analysed using the PLS-SEM 2.0 software via the algorithm, bootstrapping and blindfolding method. The construction process of this model involves two tests including the construction of the measurement model and the structure model. Testing the measurement model involves internal consistency namely (a) convergent validity and (b) discriminant validity in which these two legitimities have six analyses; (i) external loading, (ii) composite reliability, (iii) average variance extracted (AVE), (iv) Fornell-Larcker, (v) cross loading, and (vi) Heterotrait-Monotrait Ratio (HTMT). Meanwhile, the structural model testing involves the analysis of (i) Multicollinearity (Inner VIF), (ii) Path Coefficient (T), (iii) R square (R<sup>2</sup>), (iv) size effect (f<sup>2</sup>), and (v) Predictive Relevance (Q<sup>2</sup>). The findings indicate that gender discrimination and life balance have significant relationships in influencing career challenges. Hence, this model is expected to contribute to the literature in Human Resource Management. Keywords: Career challenges, life balance, female engineers, PLS-SEM

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## **Work-Life Balance Model among Female Engineers: PLS-SEM Analysis**

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**Keywords:** work-life balance, female engineers, PLS-SEM

The role of women in the career sector has the ability to improve the economic standard of the family institution as well as the local community. Nevertheless, these women are likely to leave the job sector as a result of the crisis between their commitment to the career with the household interest. In response to this issue, this study aims to build a work-life balance model that caters the demand for work-life balance among women in the century. The model comprises four independent constructs namely flexible career, childcare, leaves and family support. Meanwhile, the dependent construct of this study is work-life balance conflict faces by women. The scope of the study comprises female engineers with families and 211 respondents were selected to answer the questionnaire. The data obtained were analysed using the PLS-SEM 2.0 software via the algorithm, bootstrapping and blindfolding method. The construction process of this model involves two tests including the construction of the measurement model and the structure model. Testing the measurement model involves internal consistency namely (a) convergent validity and (b) discriminant validity in which these two legitimities have six analyses; (i) external loading, (ii) composite reliability, (iii) average variance extracted (AVE), (iv) Fornell-Larcker, (v) cross loading and (vi) Heterotrait-Monotrait Ratio (HTMT). Meanwhile, the structural model testing involves the analysis of (i) Multicollinearity (Inner VIF), (ii) Path Coefficient (T), (iii) R square (R<sup>2</sup>), (iv) sizeeffect (f<sup>2</sup>) and (v) Predictive Relavance (Q<sup>2</sup>). The findings indicate that flexible career and family support have significant relationships in influencing work-life balance conflict. Hence, this model is expected to contribute to the literature in HRM.

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## **HIGH-POWERED POLICE MOTORCYCLE: MUSCLE DISCOMFORT AMONG TRAFFIC POLICE RIDERS**

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**Keywords:** Visual Analogue Scale (VAS); riding; body region; musculoskeletal disorders; posture.

Discomfort due to riding a motorcycle is an issue that need to be addressed as it has long-term effects of MSD on motorcyclists especially among occupational motorcyclist. Thus, this study was conducted to analyse the rating of muscle discomfort and correlation with the risk factors among traffic police riders. A cross-sectional study was carried out among 137 male traffic police riders (high-powered motorcycle) with the age between 20 to 55 years old. The 10-cm visual analogue scale (VAS) questionnaire included ratings of perceived discomfort scales for 20 specific body regions was used in the study. The results indicate that the lower back (left and right) were the highest mean of discomfort which were 5.66 cm and 5.59 cm respectively. This followed with right ( $4.85\pm 3.62$  cm) and left ( $4.84\pm 3.03$  cm) upper back, and right hand ( $4.70\pm 3.30$  cm). The mean of overall discomfort ratings for all regions were more than 3cm. Besides, there is a strong positive significant correlation between duration of ridings (hours) and overall discomfort ratings ( $p < 0.01$ ,  $r = 0.785$ ) and moderate positive correlation between year of traffic police motorcycle riding experience and overall discomfort ratings ( $p < 0.01$ ,  $r = 0.410$ ). As a conclusion, cumulative riding hours, riding experience and no support of the back area of the body in motorcycle seat, are the most concern in this study as this are the contributing factors to the muscle discomfort among traffic police riders while riding high-powered motorcycle. Thus, this study suggested an additional feature is needed in current motorcycle design in order to enhance comforts of traffic police riders. Also, it will improve the condition of traffic police riders discomfort and indirectly also improve their work and health performance as well as productivity.

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## Maximum Acceptable Lifting Frequency of Novice and Worker for Manual Material Handling Task

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**Keywords:** maximum acceptable lifting frequency; manual material handlings task; novice; worker.

A study on maximum acceptable lifting frequency during manual material handling task was conducted on 15 novices and 15 workers. A laboratory experiment with two lifting loads are considered in this study: (1) 1 kg and (2) 5 kg. Each subject adjusts his frequency of lifting using a psychophysical approach. The subjects are instructed to perform combined manual material handling task as fast as they could over a period of 30 minutes without exhausting themselves or becoming overheated. The physiological response on energy expenditure is recorded during the experimental sessions. The ratings of perceived exertion (RPE) for four body

parts (forearms, upper arm, lower back and entire body) are also collected after the subjects have completed the task. The key findings of the study are the percentage difference of the MALF between novice and worker subject were 4.72% for 1 kg and 5.21% for 5 kg. The result revealed that although novice and worker did not differ significantly in MALF but a trend towards achieving significance was identified. In addition, there is a significant difference in the energy expenditure and RPE ( $p < 0.05$ ) between the novice and worker whereby the novices tend to work harder physiologically than worker. This study highlighted that the MALF study need to be experimented on the experienced worker and not on the novice to obtain a better result towards the occupational health of industrial worker.

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## **Ablution Workstations Design for Person with Physical Disabilities in Malaysia**

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**Keywords:** Ablution, workstation, preference, physical disabilities, anthropometric dimensions.

An investigation on ablution workstations design for person with disabilities has been carried out in this study. The focused were on wheelchair user or person with lower-limb impairment in Malaysia. The objective of this research is to determine the most suitable ablution workstation for person with disabilities. One hundred wheelchair users which include 74 males and 26 females participated in the study. The findings highlighted that the most suitable and preferred ablution workstation for person with disabilities is a separate design for washing hands and legs. The results also indicated that the noteworthy body parts that should be enhanced are arms, neck, trunk, and legs. Therefore, it can be concluded that it is important to design an ablution workstation with correct anthropometric dimensions referring to the population under investigation taking into account their preferences and disabilities limitation. Thus, the innovation will bring equality between people with disabilities and physically normal people in future facilities design. The workstation will become one of the worthy social contributions to the population of Muslim disabilities especially in Malaysia.

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# Association between exposure to whole-body vibrations (WBV) and vigilance level: Effect of different vibration magnitude

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**Keywords:** Drowsiness, whole-body vibration, vigilance

It is believed that exposure to whole-body vibration (WBV) may increase seated occupant drowsiness, and seated occupant drowsiness may contribute to vehicular accidents. Previous studies on driver comfort have indicated that long-term exposure to WBV may have an adverse effect on musculoskeletal disorders. However, the effects of WBV on seated occupant drowsiness have been less rigorously studied. Thus, this study aims to investigate the association between exposure to WBV and drowsiness level. Laboratory experiments were designed and involved eighteen healthy male volunteers. Volunteers were exposed to random gaussian vibration for 20-minutes with the frequency between 1-15Hz. The transmitted vibration magnitude was adjusted for each volunteer to become  $0.2\text{ms}^{-2}$  for low vibration magnitude and  $0.4\text{ms}^{-2}$  for high vibration magnitude. Volunteers vigilance was measured by the Psychomotor Vigilance Task (PVT) before and after the vibration exposure. The analyses revealed a substantial drop in volunteers vigilance level after exposure to vibration and the effect was more pronounced in high vibration amplitude  $0.4\text{ms}^{-2}$ . These findings suggested that exposure to vibration even as low as 20-minutes may attribute to the reduction of alertness level.

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## WORKSTATION WITH ERGONOMIC FEATURES FOR UNIVERSITI KUALA LUMPUR MIDI CLASSROOM

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**Keywords:** Ideal sitting position, subjective evaluation, higher concentration, improper position.

This paper presents a design process of workstation with ergonomic features for University Kuala Lumpur MIDI Classroom. The workstation is expected to support body posture, with the aim to increase comfortability of a user usage for long periods in a class. Besides that, the workstation will ensure a conducive and responsive learning environment. Discomfort and an improper position can negatively affect overall health and productivity. A new design of workstation, which allows user to sit in ideal sitting position suggested by ergonomist and easy transition from one teaching mode to the next. The researcher has designed and developed a new workstation which has ideal ergonomic sitting working position and capable

accommodate 50th percentile human size. These positions were used to evaluate the comfort of the workstation. Subjective evaluations, including comparison of the prototype and standard workstation setup, were carried out using human subjects and ergonomic principles. Result showed that the new workstation is much more comfortable, supporting the body in a balanced way. Users have the freedom to stretch and relax in different working positions before they feel any noticeable discomfort. As a result, it lets user sit for a longer period without strain, thus resulting in higher productivity and concentration in classroom.

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