International Journal of Engineering & Technology, 7 (4.19) (2018) 524-528

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper

Factors Affecting the Indirect Costs of Accidents to the Employees of Urban Rail Infrastructure Projects

Izatul Farrita Mohd Kamar[1*], Asmalia Che Ahmad[2], Mohmad Mohd Derus[3], Mohd Yusof Kasiron[4], Mohd Afandi Abu Bakar[5]

[1]*Centre of Postgraduate Studies, Universiti Teknologi MARA, Seri Iskandar Campus, Seri Iskandar, 32610 Perak, Malaysia*
[2]*Green Safe Cities Research Group, Universiti Teknologi MARA, Shah Alam Campus, 40450, Selangor, Malaysia*
[3]*Faculty of Architecture, Planning and Surveying, Universiti Teknologi MARA, Seri Iskandar Campus, Seri Iskandar, 32610 Perak, Malaysia*
[4]*Mass Rapid Transit Corporation Sdn Bhd, Jalan Dungun, Bukit Damansara, 50490 Kuala Lumpur, Malaysia*
[5]*Business Management Centre, Universiti Teknologi MARA, Seri Iskandar Campus, Seri Iskandar, 32610 Perak, Malaysia*
**Corresponding author E-mail: izatulphd@gmail.com*

Abstract

Construction activities stand as unique because most of the activities take place outdoors and under conditions that are not conducive to safety and health. The work injuries can create economic issues for the society. The stakeholders ignore the cost of an accident without realising its impacts on the industry and the country. Hence, this paper has determined the relationship between the indirect costs of the accident and the factors influencing these costs to the employee via a questionnaire survey. For this research, the employee, also known as a worker, is the person who is injured at the workplace. Multiple regression was performed on the sixty-two (62) accident cases from the MRT 1 SBK (Sungai Buloh-Kajang) Line Projects. The finding shows that the types of accident classifications, the day of the stop work order, day of the hospital admission, day of the medical leave and location of the body's injuries significantly affected the total indirect costs of the accident to the employee. These findings could heighten the importance of the effect of an accident on the Employer's awareness in improving preventive measures for a construction project.

Keywords: *Accident Costs, Indirect Costs, Employee, Urban Rail Infrastructure Project.*

1. Introduction

The issues on the poor health and safety (H&S) performance in other countries are well known including in Malaysia. The magnitude of the associated accident costs to the industry, however, is not known. Both issues are major causes for concern (KLIACS_JKKP, 2013). According to the the Department of Occupational Safety and Health (DOSH), it was reported that the number of fatalities, permanent disability, and non-permanent disability cases at the workplace was gradually increasing from 2011-2018. There were 465 fatalities and 712 injuries reported during the period of 2011-2017 (DOSH, 2017).

Recently, Malaysia had excelled in another urban rail infrastructure project with the completion of the Mass Rapid Transit (MRT) 1 line from Sungai Buloh to Kajang in July 2017. Other rail infrastructure projects which are currently in the construction progress are the MRT 2 line, from Serdang to Putrajaya, Light Rail Transit (LRT) 3 line and LRT Bandar Utama to Klang line. These developments indicate that Malaysia is in line with other developed countries that have high-speed and modern public transportation.

With these rail infrastructure projects rapid development, fatalities, serious injuries, and damage to properties at current project sites will occur each year. In contrast to the small and medium-sized construction projects, the majority of the infrastructure projects frequently comprise a range of different tasks and features (Shiferaw et al., 2012).

Due to the unique site conditions, delays, budget overruns (Kean, 2011) and hidden transaction costs have arisen (Sha, 2011). In addition, the possibility of an increase in accidents for these huge projects is greater than with other types of construction; this is, due to the high numbers of workers, large amount of plants and equipment, a lot of materials used, complicated operations, and complex activities at the site (Guo et al., 2013). Derived from the MRT accident reports, there have been a thousand incident cases for the MRT 1 Project since the project started in 2011.

Numerous studies have recognised that the costs of the accidents were considerable and expensive (Heinrich, 1959; Michaud, 1995; Everett and Frank, 1996; Jaselskis et al., 1996; Neville, 1998; Monnery, 1999; Dorman, 2000; LaBelle, 2000; Siegel & Shim, 2000; Corcoran, 2002; Goestsch, 2013; Asan, n.d.; Pellicer at al., 2014; Feng et al., 2015; Waehrer et al., 2007). Besides that, the costs from the accidents were obviously costly and affected the humans in the terms of suffering and finance (Jallon et al., 2011). Moreover, Feng, *et al.* (2015), in their discussion, it was revealed that other cost-losses to the victims and their families, employers, and society might be involved, such as impaired company image, low worker morale, labour disputes or loss of market.

There is an enormous amount of academic work involved in studying the effects of accidents to the employer (Teo et al., 2011a; Haupt & Pillay, 2016; Teo et al., 2011b), where it has an effect on the financial losses to the employer. A few years ago, various authors (Klen, 1989; Laufer, 1987; Leathers and Williams, 1984; Leopold and Leonard, 1987) revealed that studies on the

Copyright © 2018 Authors. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

costs of accidents would encourage the dynamic efforts for and awareness of accident prevention by the employers.
Although the effects of an accident to the employers have been studied in some depth, it is surprising to find that there is an abence of empirical works studying the other cost losses to victims and their families.
This study bridges this gap by measuring the economic costs of occupational accidents by using quantitative approaches. (Leigh et al., 2000) revealed that the indirect costs of an accident incurred by an employee are related to the lost opportunities of the injured employee, his/her family, the employer, the co-workers, and the community. Marchand, (2013) explained that the salary costs paid to the injured worker and the household work that cannot be performed after the injury are considered in the calculation used for estimating the indirect costs. Therefore, this study has aimed to determine the relationship between the accident costs and the factors influencing the accident costs of urban rail infrastructure projects to the employee.

2. Determinants of Accident Cost Parameters

The similarity of the cost bearer classification was found in works by Aaltonen et al., (1996); Hrymak& Pérezgonzález (2007); Australian Safety and Compensation Council (2009); Shalini (2009); Health and Safety Executive (2013); WSHI (2013); Canberra (2015) and KLIACS_JKKP (2013). Three main stakeholders that have emerged for dealing with the accident costs are the employer, employee, and government for all work-related injuries in all types of business sectors.
There are a few categories in estimating the true costs of an accident. Everett and Frank (1996) proposed three types of costs that are relevant to owners in terms of evaluating the costs of jobsite accidents, which are the direct cost of injuries and fatalities, indirect costs of injuries and fatalities, and costs of health and safety programmes. In addition, Waehrer et al. (2007) suggested that the quality of life cost could be categorised in the occupational injuries. This cost refers to the value attributed to the pain and suffering that victims and their families experience as a result of the injury, fatality or illness. Moreover, Miller and Galbraith (1995) explained that the loss of the quality of life cost was six times greater than the workplace disruption costs.
Several researchers proposed different accident cost analysis approaches. Rikhardsson et al. (2002) developed the systemic accident cost analysis (SACA) methodology. Four cost categories were used, namely, time (hours spent by employees and management on activities related to the accident), materials lost due to the accident, external services bought because of the accident (temporary replacement), and other costs incurred, such as fines and rehabilitation. However, the most typical means used in the construction industry has been to express the costs by way of direct and indirect costs (Tang et al., 2004; Gosselin, 2004; LaBelle, 2000; Corcoran, 2002).
The direct accident costs are typically the insurable costs that are covered by SOCSO and insurance companies, and they are quite easy to calculate. The examples are treatment at the site costs, hospital costs and property damage/repair costs. Whilst, the indirect costs are the costs which are not measurable in economic terms or for which there are no performance indices to measure their impacts on the organisation. These costs are the consequences of an accident that can be costly. They are more difficult to calculate and tend not to be insurable (Gosselin, 2004).
Jallon et al., (2011) and Forteza et al, (2017) identified the factors affecting the accident cost calculation in developing a model that is suitable for the work environment such as the type of accident, the number of lost days, and the days of temporary assignment. According to Feng et al., (2015), the accident frequency rate and project hazard level are the factors influencing the workplace accident costs of the building projects. Additionally, Shalini (2009), Tang et al., (2018) and the Ministry of Health Malaysia (2017) found that, in estimating the economic cost, the average number of days admitted in the general ward should be considered.
A wide variety of parameters are necessary to calculate the accident costs for the urban rail infrastructure projects. The determinants of the accident cost bearers, components, factors, and categories of this study involved a further validation from the experts to verify their suitability in the accident cost estimation of urban rail infrastructure projects. The details were drawn as per Table 1. For this research, the researcher only focused on the employee as the cost bearer. This cost refers to value attributed to the pain and suffering that victims and their families experience as a result of the injury, fatality or illness. The two most important items to calculate for the victim costs were the unpaid salary cost when they were injured and the housewives' or relatives' cost to take care of the injured worker.

Table 1: Major Variables of Accident Costs Components, Factors and Categories

Accident Cost Components	Factors Affecting Indirect Accident Costs	Accident Costs Categories
Indirect Accident Costs (IAC) Victim Costs: - Unpaid salary costs - Housewives'/Relatives' Cost to Take Care	Accident Classification (AC)	1= Class 1 (Fatality), 2= Class 2 (Permanent Disability), 3= Class 3 (Temporary Disability), 4= Class 8 (Dangerous Occurrence)
	Day of the Stop Work Order (SWO)	1= 0-14 days, 2= 15-30 days, 3= >30 days
	Day of the Medical Leave (ML)	1= 0-3 days, 2= 4-7 days, 3= 8-14 days, 4= 15-30 days, 5= >30 days
	Day of the Hospital Admission (HA)	1= 0-20 days, 2= 21-30 days, 3= >30 days
	Location of the Body's Injuries (LBI)	1= No injury, 2= Upper limb, 3= Head, 4= Trunk, 5= Lower Limb, 6= Multiple, 7= Neck

3. Methodology

This study was conducted on the work package contractors (WPC) from the viaduct (guideway) package of the KVMRT Sungai Buloh Kajang (SBK) Line Project. Eight numbers of WPC, which were representative of eight projects (V1-V8) which were selected as the sample of the study. From the above projects, 68 of the reportable accident cases, which were Class 1 (Fatality), Class 2 (Permanent Disability), Class 3 (Temporary Disability) and Class 8 (Dangerous Occurrence), occurred during the construction of those projects. The respondents returned only a total of 62 questionnaires.
The respondents, who were the safety personnel at the KVMRT project were required to answer a questionnaire based on the accident cases which had occurred in their projects. The respondents were required to provide information or estimate the accident costs components incurred to the employee based on the questions in the questionnaire.
Multiple regression analysis is used to analyse the relationship between variables using the Statistical Package for Social Sciences (SPSS) software. The log transformation is used for continuos data to decrease the variability of the data and make the data conform more closely to the normal distribution. For categorical data, multiple regression is used with dummy variables. This robust analysis was applied in this study to determine the most significant variables affecting the accident costs.

4. Results and Discussion

Five tests were performed to ensure the reliability and explainability of the MRA models, namely, the pairwise correlation matrix, correlation variance inflation factors (VIF), coefficient of determination (R^2), F-test, and T-test.

The pairwise correlation matrix is useful to predict a relationship of variables between two sets of data involving dependence. This test is also used as the first step to detect multicollinearity. The multicollinearity test is to see the correlation between each explanatory variable. It is statistically independent to another if the results show no relationship between the explanatory variables (Brooks and Chris, 2010).

If the explanatory variables are highly correlated, it will lead to an unreliable and unstable estimator. Table 2 shows that there were no variables that had collinearity index above 0.8. According to Ismail et al., (2009), there are no guidelines on which variables are causing a problem when a pair of variables is shown to have a high collinearity index above 0.8.

Table 2: Correlation Indices

	AC	SWO	ML	HA	LBI	IAC
AC	**1**					
SWO	-.124	**1**				
ML	-.474**	-.063	**1**			
HA	-.177	-.023	-.089	**1**		
LBI	-.474**	-.063	.380**	-.089	**1**	
IAC	-.784**	-.104	.664**	.324*	.501**	**1**

This study also relied on the VIF values of the independent variables as a procedure for a double check to detect multicollinearity. There are two opinions in indicating high multicollinearity using VIF values. First, O'brien, (2007) stated that a VIF value below 10 indicates low multicollinearity. Des Rosiers et al., (2000) and Thériault et al., Paul (2003) stated that a VIF value below 5 indicates low multicollinearity.

However, according to Ismail et al., (2009), there is no theoretical basis for choosing which VIF value (either below 10 or below 5) to use to detect multicollinearity. Therefore, this study adopted the value of 10 in detecting suspicious variables regarding multicollinearity. Table 4 indicates that the VIF values for all of the regressors were below 5 indicating that there was no serious multicollinearity amongst them.

Table 3: Summary of the Multicollinearity Test

Dependent Variable	Independent Variable	VIF
Indirect Accident Costs (IAC)	(AC)	1.707
	(SWO)	1.060
	(ML)	1.406
	(HA)	1.117
	(LBI)	1.406

The coefficient of determination (R^2) statistic indicates the percentage of the variance in the dependent variable that the independent variables explain collectively. It measures the strength of the relationship between the model and the dependent variable on a convenient 0-100% scale.

As indicated in Table 5, the R^2 for the MRA model of accident costs was .446. It means that the independent variables of the accident costs explained 44.6% of the variation in the dependent variable.

Table 4: Summary of the Basic Statistics of R^2

MRA Model	R^2	Adj R^2	Sig
Indirect Accident Costs	.810	.793	.000

Whislt, for the F-test, the results of the ANOVA test is shown in Table 5. The results show that the p-value or the total accident costs was 0.000, which was less than the alpha level of 0.05. Thus, it can be said that this model provides a better fit than the intercept-only model. A regression model that contains no predictors is also known as an intercept-only model.

Table 5: ANOVA Test Results of the Total Accident Costs

MRA Model	F-Value	Sig.
Indirect Accident Costs	47.738	.000

The significant variables for the MRA model are shown by the t-test result (Table 6). Out of the five variables analysed for the indirect accident costs, all variables were significant. It shows that the indirect accident costs were significantly affected by the AC ($p< 0.00$), SWO ($p< 0.05$), ML ($p< 0.00$), HA ($p< 0.00$) and LBI ($p< 0.05$). These variables had strong relationships with the indirect accident costs incurred by the employee.

The results reveal that the indirect accident costs were affected by the different types of accident classification (AC) (β=-1.760), the number of days for the stop work order (SWO) (β=-1.760), the number of days for medical leave (β=1.253), the number of days for hospital admission (β=2.114) and the different locations of the body's injuries (LBI) (β=.596).

This finding further reinforced the notion that the costs of an accident incurred by the employee are related to those in previous studies. Jallon et al., (2011) and Forteza et al, (2017) revealed that the types of accident or categories and the number of days lost and the days of temporary assignment are factors which should be included in the calculations of indirect accident costs. Whilst Shalini (2009) concluded that the number of days admitted in the hospital is related to the severity of the accident in measuring the economic costs of an occupational accident.

Table 6: The t-values of the MRA Model

Dependent Variable	Independent Variable	Coefficient	t-value	Sig.
Indirect Accident Costs (lnIAC)	(AC)	-1.760	-7.345	.000
	(SWO)	-1.760	-2.350	.022
	(ML)	1.253	4.557	.000
	(HA)	2.114	3.857	.000
	(LBI)	.596	2.169	.034

Similar findings have been observed in other studies. Tang et al., (2018) and Ministry of Health Malaysia (2017) also revealed that all these factors were significantly influential to the indirect accident costs. Moreover, Waehrer et al., (2007) described the costs of occupational injuries that were presented as three influential factors, which were the industry level, worker characteristics, and event of the injury. These results also similar with the Occupational Safety and Health (OSH) Calculator developed by the Department of Occupational Safety and Health. The calculator identified an accident classification and location of the body's injuries factors are significantly affected by the indirect accident costs (KLIACS_JKKP, 2013).

5. Conclusion

This paper provides valuable insight into the relationship between indirect accident costs and the factors affecting the costs. It can be concluded that the types of accident classifications, the day of the stop work order, day of the medical leave, day of the hospital admission and location of the body's injury were significantly affected to the indirect accident costs. These findings could facilitate an employer in estimating the accident costs and heighten the importance of the effect of an accident to the employee and their family. Also, it could enrich awareness in improving preventive measures for a construction project. A reliable estimate of the cost of accidents on construction projects may assist an employer to plan investment in safety measures in a more appropriate manner.

Acknowledgement

The authors gratefully acknowledge the Centre of Postgraduate Studies, Universiti Teknologi MARA, Seri Iskandar Campus, Seri Iskandar, for supporting this research study. The research study described in this paper is also supported by the Fundamental Research Grant Scheme (FRGS) under the Malaysian Ministry of

Higher Education (MOHE). Project code: FRGS/1/2016/SSI11/UITM/03/1. Special gratitude is also given to these industrial practitioners for their generous contributions to the development of this research, especially to the MRT Corporation Sdn. Bhd.

References

[1] Aaltonen, M. V. P., Uusi-Rauva, E., Saari, J., Antti-Poika, M., Räsänen, T., & Vinni, K. (1996). The accident consequence tree method and its application by real-time data collection in the Finnish furniture industry. Safety Science, 23(1), 11–26. https://doi.org/10.1016/0925-7535(96)00021-5.

[2] Australian Safety and Compensation Council (2009). The Cost of Work-related injury and illness for Australian Employers, Workers and the Community:2005-06.

[3] Asan, A. (n.d.). Developing an Accident Causation Model for Accident Prevention At Building Construction Sites.

[4] Brooks, Chris, and S. T. (2010). No TitleReal Estate Modelling and Forecasting.

[5] Canberra (2015). The Cost of Work-related Injury and Illness for Australian Employers, Workers and the Community: 2012-13.

[6] Corcoran, D. (2002). The Value of Estimating the Hidden Costs of Accidents. Occupational Health and Safety, 71(9), 26–30.

[7] Des Rosiers, François, Marius Thériault, and P.-Y. V. (2000). No Sorting out Access and Neighbourhood Factors in Hedonic Price Modelling. Journal of Property Investment & Finance, 18(3), 291–315.

[8] Dorman, P. (2000). The Economics of Safety, Health, and Well-Being at Work: An Overview. InFocus Program on SafeWork, International Labour Organisation, The Evergreen State College, 1–41.

[9] DOSH (2017), Department of Safety & Health (www.dosh.gov.my).

[10] Everett, J. and Frank, P., 1996, Cost of accidents and injuries to the construction industry. Journal of Construction Engineering and Management, 122, pp. 158–164.

[11] Executive, S. (2013). Costs to Britain of workplace fatalities and self-reported injuries and ill health , 2013 / 14, 1–25.

[12] Feng, Y., Zhang, S., & Wu, P. (2015). Factors influencing workplace accident costs of building projects. Safety Science. https://doi.org/10.1016/j.ssci.2014.08.008

[13] Forteza, F. J., Carretero-Gómez, J. M., & Sesé, A. (2017). Occupational risks, accidents on sites and economic performance of construction firms. Safety Science, 94, 61–76. https://doi.org/10.1016/j.ssci.2017.01.003

[14] Goestsch, D. L. (2013). Construction Safety and Health (Second). New Jersey, USA: Pearson Education.

[15] Gosselin, M. (2004). Analyse des avantages et des coûts de la santé et de la sécurité au travail en entreprise: Développement de l'outil d'analyse.

[16] Guo, H. L., Li, H., & Li, V. (2013). VP-based safety management in large-scale construction projects: A conceptual framework. Automation in Construction, 34, 16–24. https://doi.org/10.1016/j.autcon.2012.10.013

[17] Haupt, T. C., & Pillay, K. (2016). Investigating the true costs of construction accidents. Journal of Engineering, Design and Technology (Vol. 14). https://doi.org/10.1108/JEDT-07-2014-0041

[18] Heinrich, H. W. (1959). Industrial Accident Prevention: A Scientific Approach (4th ed.). McGraw-Hill Books Company.

[19] Hrymak, V., & Pérezgonzález, J. D. (2007). The costs and effects of workplace accidents Twenty case studies from Ireland. A Report for Health and Safety Authority, (March).

[20] HSE, "Costs to Britain of workplace fatalities and self-reported injuries and ill health, 2012/13," 2013. [Online]. Available: www.hse.gov.uk. [Accessed: 30-Jun-2015].

[21] Ismail, S., Hamid, A., & Iman, M. (2009). Testing For the Existence of Housing Sub-Markets In Penang , Malaysia. Malaysian Journal of Real Estate, 4(1).

[22] Jallon, R., Imbeau, D., & De Marcellis-Warin, N. (2011). Development of an indirect-cost calculation model suitable for workplace use. Journal of Safety Research, 42(3), 149–164. https://doi.org/10.1016/j.jsr.2011.05.006

[23] Jaselskis, E. J., Anderson, S. D., and Russell, J. S. (1996). "Strategies for achieving excellence in construction safety performance." J. Constr. Eng. Manage., 122 (1), 61–70.

[24] Kean, J. R. (2011). Improving project predictability with the application of critical project governance structures. Association for the Advancement of Cost Engineering, AACE 2011, 2, 1023–1035.

[25] Klen, T., 1989. Costs of occupational accidents in forestry. Journal of Safety Research 20(l): 3 l-40.

[26] KLIACS_JKKP. (2013). Kajian Mengenai Kos Kemalangan Di Tempat Kerja Bagi Sektor Pembinaan.

[27] LaBelle, J. E. (2000). What do accidents truly costs? Determining total incident costs. Professional Safety, 45(4), 38–42.

[28] Laufer, A., 1987. Construction accident cost and management safety motivation. Journal of Occupational Accidents 8: 29531.5.

[29] Leathers, K.L. and Williams, J.D. (1984), "The economics of farm accidents and safety in New Zealand agriculture", Research Project No. 3146, Agricultural Economics Research Unit, Lincoln College, Christchurch, NZ.

[30] Leigh, J.P., Markowitz, S.B., Fahs, M., Landrigan, P.L., 2000. Costs of Occu- pational Injuries and Illnesses. University of Michigan Press, Ann Arbor, MI.

[31] Leopold, E. and Leonard, S. (1987), "Costs of construction accidents to employers", Journal of Occupational Accidents, Vol. 8 No. 4, pp. 273-294.

[32] Marchand, A. (2013). Studies and Research Projects. Toxicology and Industrial Health (Vol. 30). https://doi.org/10.1177/0748233712459900

[33] Michaud, P. A. (1995). Accident Prevention and OSHA Compliance. CRC Press.

[34] Miller, T.R., Galbraith, M., 1995. Estimating the costs of occupational injury in the United States. Accid. Anal. Prev. 27 (6), 741–747.

[35] Ministry of Health Malaysia. (2017). Health Indicators 2017: Indicators for Monitoring and Evaluation of Strategy Health for All. Retrieved from http://www.moh.gov.my/images/gallery/publications/Petunjuk Kesihatan 2017.pdf

[36] Monnery, N. (1999). The costs of accidents and work-related ill-health to a cheque clearing department of a financial services organisation. Safety Science, 31(1), 59–69. https://doi.org/https://doi.org/10.1016/S0925-7535(98)00054-X

[37] Neville, H. (1998). Workplace accidents: they cost more than you might think. Industrial Management, 40(1), 7–9.

[38] November, C. (2015). The Cost of Work-related Injury and Illness for Australian Employers , Workers and the, (November).

[39] O"brien, R. M. (2007). No TitleA Caution Regarding Rules of Thumb for Variance Inflation Factors." Quality & Quantity, 41(5), 73–90.

[40] Pellicer, E., Carvajal, G. I., Rubio, M. C., & Catalá, J. (2014). A method to estimate occupational health and safety costs in construction projects. KSCE Journal of Civil Engineering, 18(7), 1955–1965. https://doi.org/10.1007/s12205-014-0591-2.

[41] Rikhardsson, P.M., Impgaard, M., 2004. Corporate cost of occupational accidents: an activity-based Accid. Anal. Prev. 36, 173–182.

[42] Sha, K. (2011). Vertical governance of construction projects: an information cost perspective. https://doi.org/10.1080/01446193.2011.637939

[43] Shalini, R. T. (2009). Economic cost of occupational accidents: Evidence from a small island economy. Safety Science, 47(7), 973–979. https://doi.org/10.1016/j.ssci.2008.10.021

[44] Shiferaw, A.S., Klakegg, O.J. and Haavaldsen, T. (2012). Governance of Public Investment Projects in Ethiopia. Project Management Journal, 43(4), 52–69. https://doi.org/10.1002/pmj

[45] Siegel, J. G., & Shim, J. K. (2000). Accounting Handbook (Third Ed.). Barron`s Educational Series.

[46] Tang, K. L., Wimmer, B. C., Akkawi, M. E., Ming, L. C., & Ibrahim, B. (2018). Incidence and pattern of medication errors in a general paediatric ward in a developing nation. Research in Social and Administrative Pharmacy, 14(3), 317–319. https://doi.org/10.1016/j.sapharm.2017.03.053

[47] Teo, E. A.-L., & Feng, Y. (2011). The indirect effect of safety investment on safety performance for building projects. Architectural Science Review, 54(1), 65–80. https://doi.org/10.3763/asre.2009.0090

[48] Teo, E. A. L., & Feng, Y. (2011). Costs of construction accidents to Singapore contractors. International Journal of Construction Management, 11(3), 79–92. https://doi.org/10.1080/15623599.2011.10773174

[49] Thériault, Marius, François Des Rosiers, Paul Villeneuve, and Y. K. 2003. (2003). No TitleModelling Interactions of Location with Specific Value of Housing Attributes. Property Management, 21(1), 25–62.

[50] Waehrer, G. M., Dong, X. S., Miller, T., Haile, E., & Men, Y. (2007). Costs of occupational injuries in construction in the United

States. Accident Analysis and Prevention, 39(6), 1258–1266. https://doi.org/10.1016/j.aap.2007.03.012

[51] WSHI, "WSH Institute Report: Economic Cost of Work-related Injuries and Ill-health in Singapore."[Online]. Available: www.wshi.gov.sg. [Accessed: 15-Jun-2015].