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Evaluating Occupational Health and Safety Management Strategy Success Factors for Small-Scale Contractors in Zambia

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Abstract: Small-scale contractors (SSCs) require management strategies in implementing occupational health and safety (OH&S) performance at projects to reduce accidents, injuries, fatalities and diseases. Management strategy success factors have been acknowledged to be of great benefit in improving in OH&S performance. Hence, the study sought to assess the management strategy success factors for the improvement of OH&S performance by SSCs in Zambia's electricity industry. Using quantitative methods, data was collected using a survey questionnaire from 246 respondents representing firm owners, managers, project managers and OH&S representatives at electricity industry projects at 70.3% response rate. Descriptive and inferential statistics were adopted as methods of data analysis using exploratory factor analysis. After analysis, the success factors were clustered into three construct categories within OH&S performance namely, compliance and workplace processes, policy and human resource development, and leadership and structure significant values ranging from 0.513 to 0.972. The independent reliability was tested using the Cronbach Alpha coefficient. The study exposed management strategy success factors are well recognised by most SSCs and contributed to the body of knowledge in this mastery by introducing three success factors for OH&S performance. It is recommended that these factors be adopted and considered to improve OH&S performance management by SSCs in the electricity industry in Zambia.

Keywords: exploratory factor analysis; management strategy; occupational health and safety; small-scale contractors; Zambia's electricity industry

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1. Introduction

Small-scale contracting firms, according to Narine [1], require intensive management for the success of occupational health and safety (OH&S) performance management. These firms, need approaches in the day to day operation and during implementation of projects to avoid the risks of incidents occurring. However, Adegbembo, et al. [2] and the Health and Safety Executives (HSE) [3] noted that even though there are major strives being made towards the improvement of conditions in OH&S at workplaces by small-scale contractors (SSCs) in the last ten years or so, annually, there has also been an increase in injuries, accidents and diseases related to the workplace. It was argued by Živković [4] that approaches in OH&S once adopted, should be able to reduce fatalities, injuries and disease in the electricity industry workplaces and at projects. The use of good practices in OH&S by firms to increase their efficiency and performance should highly be dependent on the internal environment and what works for the firm or industry [5]. Also, Agumba and Haupt [6] forwarded that there is no one size fits all approach that can be used in the operationalisation of OH&S performance management. Hence, each project or firm or country adopts the approaches that suits them. To face the ever-changing challenges at projects, SSCs' management of OH&S requires that they have appropriate strategies to curb the loss of lives, injuries and accidents and stay competitive within the industry they

operate from. One of the approaches identified from literature is management strategy [7,8] that is required by SSCs to use as a means of improving OH&S performance at projects.

The SSCs are therefore dependent on applying the right kind of management strategy factors that achieve high performance when it comes to OH&S performance improvement [4,9]. Živković, et al [4] noted that as a principle, firms' implementation of OH&S management strategies should be able to entrench OH&S activities that prevents occupational accidents, injuries, and diseases related to the workplace. The growing need for SSCs to formulate strategies that improve OH&S performance practices has made it a pre-requisite to new management practices that work for a particular type of project and industry [5]. Ali et al. [10] recommended that SSCs that develop and adopt the management strategy factors for OH&S in their daily operation, help to achieve zero accidents and reduce risk of harm on employees, damage to property and processes.

However, there are limited studies in Zambia that embrace the adoption of management strategy as an approach to OH&S performance improvement in the electricity industry, such as the study by Mwanaumo and Mambwe [7] which concentrated on entrenching organizational safety culture and not performance management. Previous studies conducted only addressed management strategy in relation to challenges and benefits, and did not highlight the factors that can be used as management strategies in improving OH&S performance in the electricity industry [4,7,11–13]. While a good number of studies [7,13–17] have identified success factors critical for management strategy to implement OH&S in other industries and countries, and the improvement of performance in the construction industry, no known study has been conducted on the management strategy success factors for SSCs in the electricity industry in Zambia using the exploratory factor analysis (EFA) through principal component analysis. Due to of the nature and scope of SSCs in the electricity and the use of EFA, this study sought to investigate management strategy success factors for the improvement of OH&S with the focus on SSCs in the electricity industry in Zambia.

2. Evolution of Occupational Health and Safety Management Strategy Success Factors

Management strategies in OH&S are defined as a bundle of decisions and acts formulated for the improvement of OH&S performance aimed at improving employee conditions and the environment [4]. Ali et al. [10] noted that OH&S management strategies have evolved with time and based on the response to social change, political, technological and economic changes. Further, OH&S management strategies have clustered historically, with the most influential event that brought about modern day OH&S management related to the Roben's 1972 report about the United Kingdom situation [18]. This also laid the foundation of modern day OH&S management systems [6] that brought about the need for education and training in OH&S, duty of care, active establishment of OH&S in organisation and industrial relations. However, each strategy adopted by any firm or nation is dependent on the affinity to improving OH&S performance as there is no acceptable standard internationally on the factors for OH&S [4,8,18]. Nonetheless, there are only guidelines and best practices on the factors from literature that have been used and have helped improve OH&S performance. Adoption of OH&S management strategy success factors are essential for planning is good safety cultural practice preventing incidents at projects.

In the study by Idris and Kolawole [14] management strategy success factors are related to plans, activities, techniques and processes adopted for the improvement of performance by firms. Hence, they are envisaged to be developed as factors for management strategy. The implementation of management strategies is crucial to the improvement of OH&S performance management through the development of factors adopted to influence OH&S positively. When factors are ignored or there is a lapse in their adoption, poor OH&S performance is experienced which leads to high incidents such as accidents, injuries, fatalities and exposure to work-related diseases, increased costs and unmotivated employees [10,15,16]. Failure to adopt management strategy factors hinders firms' effort to

take advantage of their full benefits. The management strategy is considered a facilitating element for improved OH&S performance and provides measures giving a clearer picture of the development and implementation process of OH&S at projects [17,18].

Management Strategy Success Factors

A number of studies on the OH&S success factors integral to management strategy, have been developed [16,19,20]. Mwanaumo and Mambwe [7] established seven success factors in the use of management strategy in entrenching organisational safety culture that improves performance of OH&S, and they, concluded that training, employee involvement, preventive actions, OH&S policy, reporting of accidents and near-misses, risk management and culture for continuous improvement are success factors in influencing OH&S. They emphasised that management should integrate firm's decision making with OH&S as it reduces or completely eliminates the risks and addresses safety culture and motivational issues. Jha and Kumar [21] noted that for OH&S performance management to improve, safe behaviours through reporting of accidents and near-misses, preventive and proactive measures, strategic management through policy formulation, planning OH&S and implement effective management systems through safe work culture, inspections, monitoring, checking and review plans are essential aspects in the workplace.

Doyle [22] noted that for the management strategy to be implementable, firm's management adopts six main factors that influence OH&S performance at workplaces, and forwarded leadership and commitment, risk control, communication and engagement, training and competence, performance management reviews. Zou and Sunindijo [9] in their framework proposed the use of eight factors which include new safety strategy, development of implementation plans, evaluation methods, safety economics, safety culture, skill for safety, safety training and learning, safety design. However, Wachter and Yorio [17] adopted ten factors as management practices that include employee influence, pre- and post-task safety reviews, safe work procedures, hiring of safety, cooperation facilitation, OH&S training, communication and information sharing, detection and monitoring, and safe-task assignment. Table 1 shows a summary of the success factors identified by various authors.

Table 1. Summary of Success Factors for Management Strategy.

	Management Strategy Factors														
Sources	**Development of OH&S Policy**	**Management Commitment & Accountability**	**Management Training in OH&S & Competence**	**Integrating OH&S with Management Functions**	**Safe Work Procedures**	**OH&S Planning/Design at Projects**	**Permit to Work Systems**	**Emergency Preparedness Response Plans**	**Regulatory Compliance**	**Contractual Obligations**	**Risk Monitoring and Review**	**Involvement of Stakeholders & Employees**	**Management Communication**	**Participating in OH&S Tool-Box Meetings**	**Monitoring and Supervision of OH&S**
Ng et al., (2005)	√	√		√					√		√				√
Kheni (2008)											√				
Arkson & Hadisukumo (2008)			√			√									
Fernández-Muñiz et al., (2009)	√	√	√			√			√		√		√		√
Reiman et al., (2012)			√							√					
Reiman & Pietikainen (2012)						√		√						√	√
Priyadarshani et al., (2013)	√		√	√	√	√							√		
Wachter & Yorio (2014)			√		√	√			√		√	√	√		
Podgorski (2015)															
Zou & Sunindijo (2015)	√		√			√									
Tappura (2017)	√		√									√		√	
Mohammadfam et al., (2017)	√					√			√						
Doyle (2017)		√	√				√				√	√	√		√
Liao & Chang (2017)	√							√							
Agumba & Haupt (2018)			√			√		√			√			√	
Mustapha et al., (2018)	√		√	√	√				√	√	√	√			
Jha and Kumar (2018)	√				√	√									√
Mwanaumo & Mambwe 2019)	√		√		√		√		√				√	√	√

3. Materials and Methods

The study adopted a quantitative method whose target respondents was limited to SSCs in the Zambian electricity industry and are registered with the National Council of Construction (NCC) according to the registration requirements for SSCs. According to the NCC annual report [23] a total of 7, 619 contractors were registered at the time of the study. Based on the categorisation and classification being considered for this study, the SSCs range from Grade 4 to Grade 6. They represent 92% of the total registered contractors with NCC of which the remainder was foreign owned [23].

The study used the probability sampling which enables all groups of SSCs to be included in the survey ensuring a fair representation which involves a more controlled approach allowing each population to be chosen. According to Kothari [24] each category is allowed the opportunity to participate. In the current study, the Grading system from 4 to 6 was used for categorisation. The use of probability sampling in this study was because it reduces systematic errors, bias, increases accuracy and increases the possibility of making inference of the results about the target pollution [24,25]. The process for probability sampling used in the study was simple random sampling in which the target population is included in the study but respondents are selected randomly, and considered highly representative of the population [24,26]. Only 246 respondents from the sample of 350, filled out a structured questionnaire, thus these 246 responses were used for our analysis.

The structured closed-ended questionnaire had two sections, the background information of the respondents with emphasis on experience in implementing projects in the electricity, number of employees employed annually on average, category of registration and type of contracts they are engaged to implement. The second section solicited information that relates to the respondents' view on the influence of management strategy factors. Respondents were requested to rate the level of influence of the identified factors on a five-point Likert scale following, 1 = No extent, 2 = Low extent, 3 = Moderate, 4 = Large extent, 5 = Very large extent. The questionnaire was distributed through email using a link developed from google forms.

The reliability and internal consistency of the questionnaire was done using the Cronbach Alpha test and was found to be 0.944 which was greater than 0.70, the threshold for adequacy according to Taber [27]. Mean item score and the exploratory factor analysis (EFA) using the Statistical Packages for Social Sciences (SPSS) Software Version 26 were used for analysis. The adoption of the EFA as a method of analysis was used in order to establish the fundamental dimensions for management strategy.

Pallant [28] noted that the EFA is used to confirm the validity and reliability of the proposed factors and show the significant difference of one group from another. The analysis also allows for data reduction into smaller sets of factors grouped according to their intercorrelation [25]. The first step was to select the bivariate correlation in order to assess the strength of the research factors adopted. The analysis process used the principle component analysis with direct Oblimin for extraction. The rotation adopted was oblique which is correlated [28]. The use of oblique rotation allows correlation so that higher eigen values could be attained [25]. The explained correlation pattern set for the analysis was 0.3 coefficient and above, indicating a good measure of the variables [25,28].

The next step was to assess the adequacy of the survey data using the Kaiser-Meyer-Olkin (KMO) and Bartlett's test of specificity for squared correlation between variables [26,29]. Following Tabachnick and Fidell [25], the KMO with a value close to 1 relates to relative compactness, distinct and reliable at a minimum value of 0.05 [27]. However, in order to measure the appropriateness of the large correlations between variables, the Bartlett's test of sphericity was conducted. Bartlett's test of sphericity measures the existence of sufficiently large correlations between variables in order for factor analysis to be appropriated [26]. Thus, KMO values ≥ 0.7 and Bartlett's test of sphericity ($p < 0.05$) were considered as factor analysability in this study.

4. Results

This section is divided into three, background information, mean score and ranking, and exploratory factor analysis for the management strategy success factors.

4.1. Background Information

A total of 70.3% as a rate of response was achieved with a number of 246 replies recorded, and used as data for analysis in this study. However, from the results, 36.6% from the overall responses indicated having experience in implementing projects in the electricity industry in Zambia. Only 63% of the small-scale contractors had 5–15 number of employees employed annually on average. Also, 37.5% of the small-scale contractors are registered within the Grade 5 grading system as provided for by the NCC. However, majority of the small-scale contracting firms are involved in activities such as building and housing 22%, works of civil engineering in nature 20.7%, telecoms and general electrical 18.7%, services that are specialised 11.8%, mining that is construction related 10.6%, road and earthworks that are general 6.9%, works of mechanical engineering in nature 6.9%, and other services that may be provided 1.6%.

4.2. Assessing the Success Factors for Management Strategy

The study assessed the mean score of the factors proposed for management strategy as presented in Table 2 which showed that development of OH&S policy, monitoring and supervision of OH&S, permit to work systems were ranked highest success factors to the improvement of OH&S performance at projects. However, integrating OH&S with management functions, involvement of stakeholders and employees, and management commitment and accountability were ranked the least. All the 15 identified success factors had a mean value above the 3-point threshold as recommended by Kothari [24] and Tabachnick and Fidell [25]. The factors were also found to be statistically significant. The most highly ranked factor with a mean score of 4.44 was Development of OH&S policy followed by monitoring and supervising of OH&S with a mean score of 4.41. The least ranked success factors indicate, Integrating OH&S with management functions at 4.10 mean score, Involvement of stakeholders and employees, at 4.09, and Management commitment and accountability with mean score of 4.08.

Table 2. Success Factors for Management Strategy.

Success Factors	Mean Score	Standard Deviation	Ranking
Development of OH&S Policy	4.44	0.959	1
Monitoring and supervision of OH&S	4.41	0.831	2
Permit to work systems	4.30	0.871	3
Management training in OH&S & competence	4.28	0.846	4
Risk assessment Monitoring and review	4.25	0.881	5
Participating in OH&S Tool-Box meetings	4.24	0.932	6
Management communication	4.24	0.809	7
Ensuring regulatory compliance	4.24	0.807	8
Meeting contractual obligations	4.23	0.897	9
Safe work procedures	4.22	0.947	10
OH&S Planning and Design at projects	4.21	0.869	11
Emergency preparedness response plans	4.13	0.919	12
Integrating OH&S with management functions	4.10	0.964	13
Involvement of stakeholders and employees	4.09	0.919	14
Management commitment and accountability	4.08	0.799	15

4.3. Exploratory Factor Analysis of Management Strategy

The factor analysis was carried out on the success factors for management strategy. The Kaiser-Meyer-Olkin (KMO) was 0.925 while the Bartlett's test for sphericity gave a

significant value of $p = 0.000$. These results indicate that the data set for factor analysis is suitable. Table 3 indicates the results.

Table 3. The KMO and Bartlett's Test for the Management Strategy Success Factor.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**0.925**
Bartlett's Test of Sphericity	Approx. Chi-Square	3488.691
	df	105
	Sig.	0.000

The Cronbach's Alpha value attained was 0.952 indicating statistical reliability of the data, as it was greater than 0.7 the cut-off for good measure [30,31] also indicating the possibility of factor analysis since the values are reliable and valid for the study Lower values of below 0.7 indicate low interrelatedness of the questions between factors [26,31]. The item-total correlation corrected was greater than the recommended cut-off value of 0.3, indicating that the items were a good-measure of the element. The average communality values was above 0.708 implying acceptability [6].

A component matrix with eigen values was derived from SPSS and components with values greater than one were considered while all factors with values below one, were not considered. The study retained the three components that met the Kaiser criterion as illustrated in Table 4 and were explained by a cumulative percentage of 78.049%, relating with a total variance of 59.096%, 10.725% and 8.227%. In terms of the overall explained percentage, the results showed that the it was more than or equal to the proportion of variance cumulatively which should 50% and above as explained by Dogbegah et al. [32]. Hence, the data represented in the study was represented significantly.

Table 4. Total Variance Explained.

Component No.	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**	**Total**
1	8.864	59.096	59.096	8.864	59.096	59.096	8.102
2	1.609	10.725	69.821	1.609	10.725	69.821	1.766
3	1.234	8.227	78.049	1.234	8.227	78.049	5.287

According to Pallant [28] a scree plot is vital for the determination of components retained. The point at which the slope of the scree plot clearly levels off indicates the number of components to be retrained for further analysis. From the scree plot in Figure 1, an elbow shaped plot was determined with components above the elbow retained. The flatting after the elbow which is the third component can be seen distinctively. Further evidence shows that the eigen value more than one, are three component numbers and those less than one can be excluded. Also, since EFA is used to reduce the variables, a smaller number of interpretable and yet reasonable and above one, in the case of the scree plot in Figure 1, is three. This agreed with the total variance explained which equally gave evidence of the eigen values with total variance above one to be considered for analysis [8,28,31]. In this case three component values were considered. The others had total loadings of sums of squares less than one, thus, were not included for analysis.

The factor analysis results for the success factors for management strategy indicates that the 15 items resulted in three components namely Compliance and Workplace Process, Policy and Human Resource Development, and Leadership and Structure.

Component 1—Compliance and Workplace Processes:

Compliance and workplace processes was the first component extracted during factor analysis and was explained with 59.10% of 78.05% was observed with a higher value as

compared with the other components that were represented in the first and third clusters. These results imply that there is a criticality in the factor loadings for the first component as illustrated in Table 5.

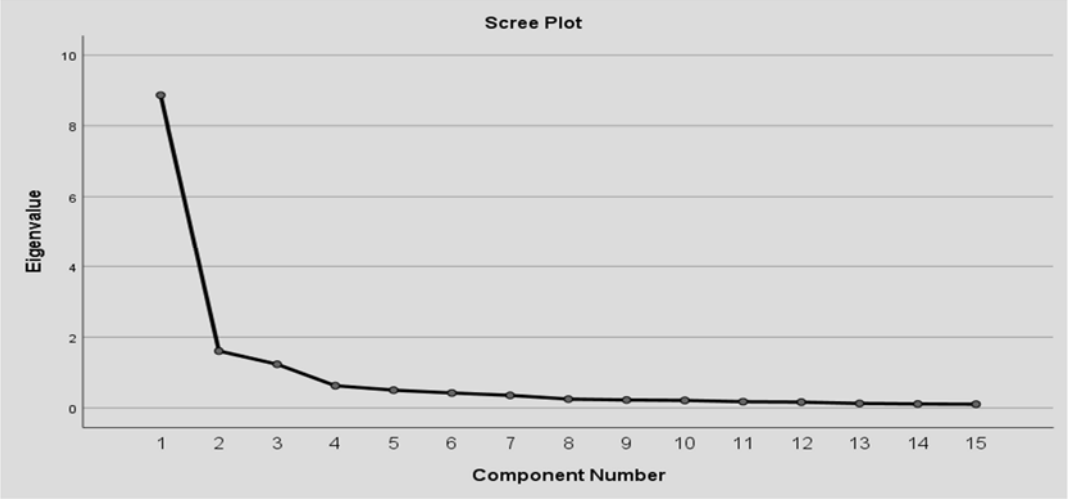

Figure 1. Success Factors Scree Plot for Management Strategy.

Table 5. Factor Loading for the Success Factors of Management Strategy.

Code	Success Factors	Comp. 1	Comp. 2	Comp. 3	Alpha Value
Compliance and Workplace Processes					
[a] MSF10	Safe work procedures	0.972			
MSF7	Management communication	0.953			
MSF12	Emergency preparedness response plans	0.859			0.946
MSF8	Ensuring regulatory compliance	0.841			
MSF5	Risk assessment mitigation/review	0.839			
MSF14	Involvement of stakeholders and employees	0.749			
Policy and Human Resource Development					
MSF13	Integrating OH&S with management functions		0.698		
MSF4	Management training in OH&S competence		0.695		0.894
MSF1	Development of OH&S Policy		0.868		
MSF3	Permit to work systems		0.772		
Leadership and Structure					
MSF2	Monitoring and supervision of OH&S			0.542	
MSF9	Meeting contractual obligations			0.560	
MSF15	Management commitment and accountability			0.514	0.944
MSF11	OH&S Planning and Design at projects			0.610	
MSF6	Participating in OH&S Tool-Box meetings			0.513	

Principal Component Analysis. Rotation Method: Oblimin with Kaiser Normalization [a]. MSF = Management Strategy Factor.

Component 2—Policy and Human Resource Development

The second component had a 10.73% total variance explained and allocated the name, policy and human resource development, which comprised of four variables. The five items in component 1 had a loading above 0.5 significance value. The group Cronbach Alpha test values attained was 0.894 hence the data set was reliable.

Component 3—Leadership and Structure

The third component, leadership and structure, accounted for 8.23% of the variance that was explained with five items. Component 3 had five items with values loaded above 0.5 significance level value. The component had a Cronbach Alpha value of 0.944 indicating reliability of the data set and questionnaire.

5. Discussion

The management strategy success factors for the improvement of OH&S performance by SSCs in the electricity industry was assessed and development of OH&S policy, monitoring and supervision of OH&S, and permit to work systems were ranked highest success factors for the implementation of OH&S performance management. However, the least ranked of the fifteen success factors are integrating OH&S with management functions, involvement of stakeholders and employees, and management commitment and accountability. Nonetheless, the factors identified had a mean value above the cut-off of 3-point as recommended by Kothari [24], and Tabachnick and Fidell [25]. This indicates that, all the factors are statistically significant. This result is in line with the studies by Mustapha et al. [8] and Agumba [33] who asserted that policy in OH&S and monitoring and supervision are the suggested management strategy areas that strongly influence the OH&S performance management at projects and can be adopted by SSCs.

In the same vein, Mwanaumo and Mambwe [7], Grant [34], and Olusuyi [35] concluded that permit to work systems are necessary success factors that are significant in ensuring that work is done safely and efficiently for high hazardous industries. Actions once placed as strategies assist in requesting, documenting, authorising, reviewing and deconflicting tasks that for employees. Projects in the electricity industry such as in the power stations require permit to work authorisations, otherwise if not carried out, the risks of incidents increase and could be catastrophic to the entire power system.

On the other hand, Herrera [36] and Mwanaumo et al. [18], asserted from their findings that involvement of stakeholders and management commitment and accountability are the best tools for promoting OH&S improvement at projects even though this study found it to be weak, based on the ranking attained from the results of this study. Other studies also have ascertained the importance of integrating OH&S with management functions, involvement of stakeholders and employees, and management commitment and accountability, to be high [10,16,37]. Additionally, planning OH&S, management support and capacity building are important aspects that help in safeguarding the staffing levels of employees, prevention of diseases such as the SARS-CoV-2 (COVID-19) which has recently come to the fore, managing time allocations for doing work, as stipulated by the World Health Organisation (WHO) Guidance for 2020.

Component one, compliance and workplace processes, yielded and explained the highest variance with the value of 59.10% from the total variance of 78.05% indicating that the factors in the particular component are critical or highly significant in influencing the improvement of OH&S performance. These factors include safe work procedures, management communication, emergency preparedness response plans that also encompass management of outbreaks, epidemics and pandemics like the COVID-19, ensuring regulatory compliance, risk assessment mitigation and review, and involvement of stakeholders and employees. These factors were affirmed of being significant in influencing OH&S performance in several studies [17,21,33]. Workplace processes under this component include process such as OH&S policies, grievances, health care and disease prevention guidelines.

The second component of the factor analysis named policy and human resource development had four factors in the cluster grouping. These factors include, integrating OH&S with management functions, management training in OH&S and competence, development of OH&S policy, and permit to work systems. This is in line with Fernández-Muñiz et al. [38] and Arkson and Hadisukumo [5]. Also, training management in matters of OH&S for competence influences the performance of OH&S significantly and leads to job retention, management trust and job satisfaction [12,39]. From the factor reduction conducted, the third component was named, leadership and structure, and had five factors grouped in one cluster. The factors include, monitoring and supervision of OH&S, meeting contractual obligations, management commitment and accountability, OH&S planning and design at projects, and participating in OH&S tool-box meetings. The results indicated that management commitment and accountability and participating in OH&S tool-box

meetings are influential in the entrenchment of the firm's OH&S culture. This is in tandem with studies by Mambwe and Mwanaumo [40] and Agumba [33].

6. Conclusions

Small-scale contractors including project managers and safety managers at projects recognised the significance of all the identified management strategy success factors to improve OH&S performance by SSCs. The study indicated that development of OH&S policy, monitoring and supervision of OH&S and permit to work systems are the most significant and critical categories of success factors for SSCs. However, even if integrating OH&S with management functions, involvement of stakeholders and employees, and management commitment and accountability were least ranked, they are significant to influencing the OH&S performance management by SSCs. These help in the OH&S planning, building capacity and managing fair staffing levels, workloads including work time to reduce employee stress.

From the findings and conclusion originated from this study, it is recommended that SSCs should recognise the significance of adopting, compliance and workplace processes, policy and human resource development, and leadership and structure, in developing successful management strategy practices for the improvement of OH&S performance management. The findings of this study will contribute to the application of these management strategy success factors to improve OH&S performance by SSCs in other industries such as the construction, health, agricultural, petroleum and oil, in Zambia, within the Southern African region and in developing countries with similar OH&S issues.

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