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The Relationship between Safety Management Systems, Safety Performance and Customer Satisfaction in the Australian Construction Industry: A Quantitative Research Proposal

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Abstract- *Although the number of work health and safety (WHS) research in construction has increased over the past 15 years, there is still limited research in the area of safety management system (SMS) and its impact on organizational outcomes such as customer satisfaction. The main objective of this research proposal is to provide the foundation for a potential future study that explores the relationship between safety management system, safety performance and customer satisfaction from the prospective of 383 site supervisors in Australian construction business using a multiple regression quantitative approach. A positive relationship between SMS, safety performance and customer satisfaction will support the business case for developing and implementing SMS in construction business and motivate management to invest in WHS.*

Keywords: *construction; customer satisfaction; quantitative research proposal; safety management system; safety performance; work health and safety*

1. INTRODUCTION

The building and construction industry is the second largest industry in Australia. It is made up of approximately 345,000 businesses, employs 1.1 million Australian (8.9% of total employment in Australia), and accounts for 8.1% of GDP (Masters Builders Australia, 2017).

According to Safe Work Australia (2018), the construction industry is considered a relatively high risk industry ranked third for the number of fatalities and serious workers' compensation claims over the last five years (accounting for 16% of fatalities and 11% of serious claims). This situation impacts negatively on the physical, mental and social wellbeing of employees, increase cost of production, and make business less competitive (Koper, Moller, & Zwetsloot, 2009)[13].

Researchers (Cohen, 1977[3]; O'Toole, 2002[19]; Tsao, Hsieh, & Chen, 2017)[29] argue that the successful development and implementation of SMS positively influence employers' and workers' understanding of their rights, responsibilities and obligations under Work Health and Safety (WHS) laws which improve safety performance. A study by (Muniz, Peon, & Ordas, 2009[18]; Rechenthin, 2004)[20] found a positive relationship between SMS, safety performance, and competitive advantage in the Spanish industrial, construction and services industries.

Cronin and Taylor (1992)[4] consider customer satisfaction an important mean of achieving competitive advantage in the market place because it leads to higher loyalty (Caruana, 2002)[2] and repurchase intentions (Taylor & Baker, 1994)[27], increases word-of-mouth recommendation (Vandermerwe, 1994)[30], insulates customers from competition and lowers the costs of acquiring new customers (Lovelock, Patterson, & Wirtz, 2011)[14]. Therefore, it is frequently argued that customer satisfaction must be the main goal for all business (Morgan, Anderson, & Mittal, 2005)[17].

2. OBJECTIVE AND SIGNIFICANCE OF THE STUDY

Although the number of WHS research in construction has increased over the past 15 years, there is still limited research in the area of SMS (Sanchez, Pelaez, & Alis, 2017)[22] and its impact on organizational outcomes such as customer satisfaction (Willis, Brown, & Prussia, 2012)[32].

The main objective of this quantitative research proposal is to provide the foundation for a potential future study that explores the relationship between SMS, safety performance and customer satisfaction in the Australian construction industry. A positive relationship between SMS, safety performance and customer satisfaction can bolster the business case for WHS in the construction business by encouraging management commitment and approval for investment in WHS. In addition, a positive relationship will demonstrate that WHS is not simply an issue of doing the right thing or avoiding costs associated with lost-time injuries and related expenses, but a solution

to reducing accidents, absenteeism and increasing productivity and job satisfaction (Willis et al., 2012)[32].

3. SAFETY MANAGEMENT SYSTEM

According to Muniz et al. (2009), SMS is a planned process integrated within the business operation designed to ensure that every precaution is taken to reduce or eliminate the likelihood of an incident in the workplace, ensure compliance with the relevant legislations, and create awareness, understanding, motivation and commitment among all business employees. SMS improve business productivity, product quality, economic and financial results (O'Toole, 2002)[19]. However, its implementation success depends on management's commitment (Zohar, 1980)[33].

3.1 Components of a Safety Management System

SMS consists of safety policies, incentives, training and development, communication, planning, and controls (Muniz et al., 2009)[18].

3.1.1 Safety Policy

A safety policy shows that a business is committed to the safety of its employees, contractors, clients, and public. It includes short and long term objectives as well as complying guidelines and procedures in relation to WHS (Donald & Canter, 1994)[5].

3.1.2 Incentives

Incentives through rewards/punishments encourage employees to participate in the various WHS activities, which aim to get feedback, and promote and build a safety culture in the work environment (Eiff, 1999[6]; Vredenburgh, 2002)[31].

3.1.3 Training and development

WHS continuous training enhance employees' abilities, competencies, skills, and aptitude in terms of risk identification, assessment, and control (O'Toole, 2002[19]; Silva, Lima, & Baptista, 2004[24]; Vredenburgh, 2002)[31].

3.1.4 Communication

Clear and effective communication of information ensures that the workforce is up to date with the latest changes to safety policies, legislations and procedures which help in identifying, responding, and controlling WHS incidents in the workplace (Silva et al., 2004[24]; Siu, Phillips, & Leung, 2003)[25].

3.1.5 Planning

Planning can be emergency and preventative. Emergency planning build systems and processes that help business and its workforce apply an educated prompt response to risks, while preventative planning build systems and processes that help business and its workforce prevent risks and ultimately avoid incidents (Guldenmund, 2000[9]; O'Toole, 2002)[19].

3.1.6 Control

Control is developing processes and procedures that suit the specific workplace environment to ensure compliance with specific government and industry safety standards, and aim to reduce or potentially eliminate risks (Grote & Künzler, 2000[8]; Vredenburgh, 2002)[31]. Control is executed internally by analysing working conditions and events occurring within the business (Kjellen, Boe, & Hagen, 1997)[12] and externally through benchmarking techniques that compares with other business' safety records (Fuller, 1999)[7].

4. CUSTOMER EXPECTATIONS AND SATISFACTION IN THE CONSTRUCTION INDUSTRY

The construction industry is considered one of the most injury-prone industries worldwide in terms of severe worker injuries, and lost work time (Maloney, 2002)[16]. As a result, there is an increase in media coverage of whether construction companies are meeting their WHS obligations toward their stakeholders, an issue important to customers' productivity and profitability. This has lead customers to form expectations and favour companies that comply with government standards and regulations, behave honestly and fairly, do its outmost to ensure the health and safety of its stakeholders, and boycott others who have negative social behaviour (Kiran & Sharma, 2011)[11]. These expectations have put construction companies under great pressure to learn, understand and comply with their social obligations in order to stay competitive while creating value for themselves, and the people in general (Kiran & Sharma, 2011)[11].

According to the disconfirmation of expectation paradigm, which is considered the dominant model in the satisfaction research (Tian-Cole, Crompton, & Willson, 2002)[28], customer satisfaction is achieved when company service performance exceeds client's pre-purchase expectations (positively disconfirmed). In contrast when performance is less than expectation, dissatisfaction results (negatively disconfirmed).

5. HYPOTHESIS

A quality SMS improve safety performance because it reduces accidents, increases employee productivity and motivation. It also improves quality of products by reducing the number of interruptions in the productive process and material waste which is important to customers' productivity and profitability therefore, improve customer satisfaction.

The above reasoning leads to the following hypotheses:

Hypothesis #1: There is a positive relationship between SMS in construction business and safety performance.

Hypothesis #2: Safety performance mediates the relationship between SMS in construction business and customer satisfaction.

Hypothesis #3: Business in different construction sub-industries perceives the importance of SMS differently.

Hypothesis #4: Small, medium, and large construction business perceive the importance of SMS differently.

6. VARIABLES AND MEASURES

6.1 Key Variables

The conceptual model consists of three key continuous variables SMS (independent), safety performance (mediator), and customer satisfaction (dependent). Customer satisfaction is the variable of primary interest. The hypothesised relationship among the three key variables is shown in Figure #1. Two categorical independent variables, construction sub-industries, and business size are also part of this study.

6.2 Measurement

Thirty four items from (Muniz et al., 2009)[18] are used to measure the six dimensions of SMS: safety policy (4 items), employee incentives (5), training (9), communication (4), planning (7), and control (5). These six dimensions are selected among other dimensions because they allow examining the relationship between SMS and the other relevant constructs, and are considered most meaningful to the customers in measuring their satisfaction. Safety performance in terms of absenteeism, employee turnover, productivity, reduced workplace accidents, reduced motivation, and service quality are measured using a 6 items measure from (Muniz et al., 2009)[18]. Customer satisfaction based on the total assessment of the customer's overall purchase and consumption experience with a service over time is measured by three items from (Sunindijo, Hadikusumo, & Phangchunun, 2014)[26], who used these measures to investigate the relationship between service quality, customer satisfaction and behavioural intentions in the construction industry. Factor analysis has been used to confirm the dimensions of each construct that has been operationalized, and to indicate which of the items are most appropriate for each dimension, thus establishing construct validity. All items are measured on a 5 point Likert-type interval scale ranging from "1=strongly disagree" to "5=strongly agree". The measures are reported by their developers to have convergent and discriminant validity. The categorical variables, construction sub-industries, and business size are both tapped by a single question that categorizes each into three groups (carpentry, roofing, and electrical), and (1-20, 21-50, and above 50 employees) respectively.

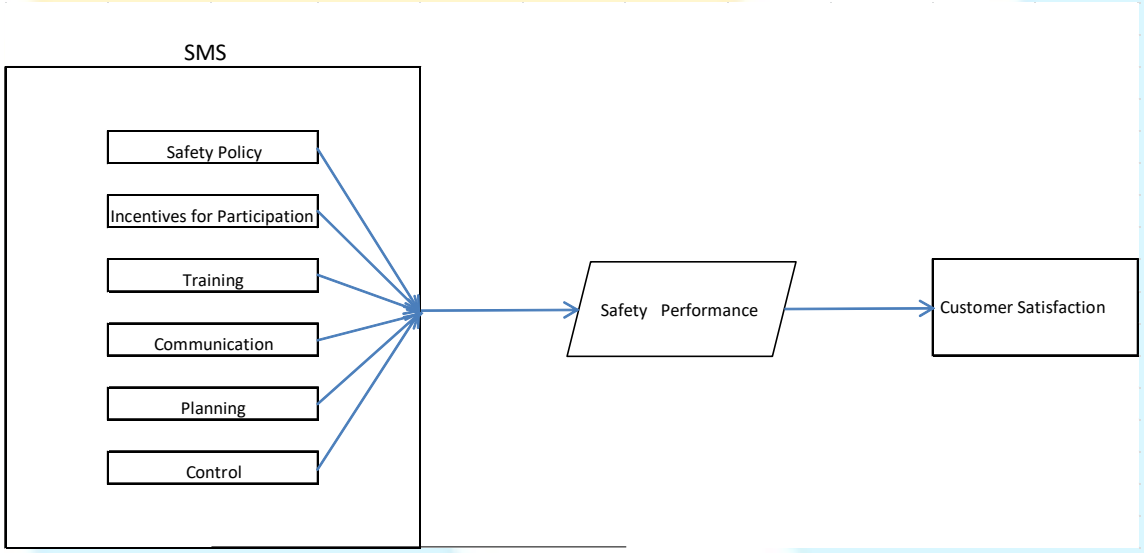

Figure #1: The hypothesised relationship among the three key variables

6.3 Sampling

6.3.1 Population and Sampling Frame

The target population is made up of all construction companies located in the state of New South Wales, Australia. The sampling frame size is 732,305 construction businesses based on latest data update as of June 2017 (Australian Bureau of Statistics, 2018).

6.3.2 Sample Size

Considering the sample frame size, a sample size calculator is used to calculate the sample size based on a confidence level of 95%, and a confidence interval of 5%. A total of 383 respondents will be necessary ensuring statistical power as suggested by (Hair, Tatham, Anderson & Black, 1998). According to Sekaran and Bougie (2013)[23] a 30% response rate is considered acceptable when using self-completion questionnaire therefore, 1,276 construction businesses will need to be contacted.

6.3.3 Sample Subjects

The sample subjects consists of site supervisors since they are the ones that interact on daily basis with management, site workers, and customers therefore, they are in a strong position to provide accurate information in relation to the business' SMS, safety performance, and the customer response to the service provided. If the business doesn't employ a site supervisor, then the most senior employee is selected as part of the sample. This study employs the business as the unit of analysis.

6.3.4 Sampling Techniques

This study uses simple random sampling because it provides the least bias and offers the most

generalizability. The sample consists of construction businesses in the state of New South Wales (NSW). This means that all the surveyed businesses conduct their operations in the same region, which preserves the necessary homogeneity in terms of legal context and WHS regulations largely determined by the state government.

7. DATA COLLECTION

A self-completion questionnaire is used. Although it introduces a much larger chance of nonresponse or missing data resulting from partially or not answered questions and does not give researchers the freedom to ask many open questions because respondents don't want to write a lot, a self-administered questionnaire is more convenient to both respondents and researcher considering the expanded geographical coverage of this study. It requires minimal staff, thus provides the lowest cost option. It is an efficient data collection method considering the descriptive and correlational nature of this study.

A covering letter is mailed to respondents prior to sending the questionnaire explaining the reasons for the research, why it is important, how it will be used, in addition to the implications for them as participants, and provide a guarantee of confidentiality. The covering letter is followed by the self-completion questionnaire. Follow up letters is sent out to non- respondents two weeks after the initial mailing. The researcher's fax and email address is supplied to facilitate the process of responding to the questionnaire.

8. ANALYSIS

8.1 Editing Data

The purpose of data editing is to detect and correct illogical, inconsistent, or illegal data omissions in the information returned by the participants of the study which could have a large impact on the results of the research. SPSS, Version 20 for Windows is used to generate frequency tables to detect dispersions of data and illegal coding, as well as scatterplots to check for outliers. Inconsistent responses are followed up with the respondents, where possible. Omissions are dealt with by either not including a questionnaire in the data set for analysis or producing a logical answer based on the participant's pattern of responses to other questions. This depends on the number of unanswered items.

8.2 Data Transformation

Data transformation is used to convert the total scores of a participant to a concept into a single score by dividing the total number of scores by the number of items used to measure the concept. This is carried out after ensuring that the interim consistency is satisfactory, and reverse coding is conducted where applicable.

8.3 Descriptive Statistics

Descriptive statistics reports from SSPS are used to evaluate frequency distributions for all variables, measures of central tendency and dispersions. This indicates whether the responses range satisfactory over the scale and detect any possible biases or not properly worded questions. Histograms, boxplot, and skewness and kurtosis statistics are used to check for data normality, which is a prerequisite for inferential statistical techniques.

8.4 Goodness of Data

The reliability of the measures is established by testing the internal consistency among the items measuring the concept. The Cronbach's alpha is used as an indicator of the internal consistency. The Cronbach's alpha of the measures discussed in the Key Variable section, as measured by their developers, range from 0.7 to 072, which is considered acceptable (Sekaran & Bougie, 2013)[23]. The measures are also well-validated by considering content validity, convergent validity, and discriminant validity. Content validity ensures that the measures include an adequate and representative set of items that tap to the concept. The convergent validity of a concept evaluates to what extent two measurements of the concept may be correlated, while the discriminant validity indicates to what extent two conceptually similar concepts differ (Sekaran & Bougie, 2013)[23]. Furthermore, factorial validity, which is a multivariate technique, is established to confirm the emergence of the theorized dimensions of the variables.

8.5 Testing Hypothesis

Descriptive statistics, one-way analysis of variance (ANOVA), multiple regression analysis, and a regression coefficient from multiple regression analysis are used in this study.

Multiple regression analysis is used to test hypothesises #1 and #2. Three regression models are to be estimated. Model #1: Regressing safety performance on the six variables of SMS: safety policy, employee incentives, training, communication, planning, and control. Model #2: Regressing customer satisfaction on the six variables of SMS. Model #3: Regressing customer satisfaction on the six variables of SMS and safety performance. Separate coefficients for each model are estimated and tested. Beta coefficients provide which independent variable has the largest impact on the dependent variable, while an R-squared provides a statistical measure of association that tells us the percentage of variance in the dependent variable that is explained by the variation in the independent variable.

In order to establish mediation the following conditions must hold: An SMS must affect safety performance in model #1, an SMS must show to have an impact on customer satisfaction in model #2, and safety performance must affect customer satisfaction in model #3, while controlling the six SMS variables. If these conditions all hold, then the effect of an SMS should be less in model

#3 than in model #2. Perfect mediation will be achieved when the effect of SMS on customer satisfaction is no longer significant in model #3, while partial mediation will be achieved if SMS still affect customer satisfaction in model #3.

The ENTER variable selection method involving all six variables of SMS is used for the sample of respondents. The correlation matrix is used to test for multicollinearity by detecting any significant positive correlation between each pair of the independent variables. If multicollinearity is an issue, the variance inflation factor and condition index are examined to obtain further inferences. The presence of multicollinearity can result in a Type II error. Outliers, normality, and independence of residuals are assessed through regression analysis.

Hypothesis #3 and #4 are tested using descriptive statistics, and one-way ANOVA with post-hoc comparisons, which is not theoretically driven. This test shows if construction businesses perceive the importance of implementing SMS differently based on the construction sub-industry they serve and their size. The two categorical independent variables, construction sub-industries and firm size, are measured at different levels measured on an interval scale. The descriptive statistics provides the means, standard of deviations, minimum and maximum data. All the statistical significance tests are performed with the alpha level set at 0.05. If the results of the ANOVA are found to be significant, then we accept the hypothesis (#3 and #4), and a Tukey's HSD test is carried out to assess where the significance lies. Also, a Levene Statistic, a test of homogeneity of variances, is conducted to ensure that the homogeneity assumption is not violated. The assumption for normality is checked for using normality statistics such as skewness.

9. LIMITATIONS

The strength of this study stems from the fact that a positive relationship between SMS, safety performance and customer satisfaction support the business case for developing and implementing SMS in construction business and motivating management to invest in WHS. This study also defends the claim that WHS is not only a matter of doing the right thing or averting costs associated with lost-time injuries, but also a strategic issue that leads to customer satisfaction and improved business profitability.

On the other hand, this study has some limitations. Although the constructs in this study have been defined as accurately as possible based on existing literature, and the measuring items have been selected from similar studies in the current literature to suit the context and objective of this study, we can only consider these measures as only an approximation to the phenomena under study which can't be fully measured. In addition, the relationship between the variables is evaluated from the point of view of site supervisors only and is based on their willingness to participate. A site supervisor in a business with a well-developed safety climate maybe more willing to take part in the study, which could lead to bias.

It is recommended, in future studies, to gather managers', employees' and customers' opinions in order to obtain a comprehensive view of the results. Furthermore, future studies should consider the impact of customer type on the importance of implementing SMS as customers, such as government departments, age care, and hospitals maybe more sensitive to WHS than others. Therefore, businesses that deal with these customers must strictly adhere to WHS and have SMS. In addition, this study focuses on businesses in the construction industry and might not be generalizable to other industries where WHS isn't as critical.

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